JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXVI., No. 2658.] TUESDAY, APRIL 21, 1914. [66TH YEAR.

EDITORIAL NOTES.

The Prophets and London Electricity Supply.

THE long looked-for report by Messrs. Merz and M'Lellan to the London County Council on the present position, and the need for the future development, of the supply of electrical energy in London has been issued. It is quite on the expected lines, and does not contain anything in the shape of a suggestion that is in any wise novel. It is a report such as anyone would anticipate enthusiastic electrical experts would draw up in dealing with London. It is optimistic in its every part; and its optimism has a very heavy foundation of hypotheses, which may be shown to be seriously deficient in worthiness by the course of future developments. It was not so many years ago that Mr. Merz was the moving spirit in a large power and bulk scheme that prediction said was going to revolutionize things electrical in London, and completely transform the city of cities. But protracted parliamentary contest opened the eyes of Mr. Merz and those associated with him; and they came to the conclusion, if memory does not deceive us, that there was not much gain to be derived from such a scheme compared with the existing territorial compartment system of generation and supply. So the project over which so much time and money had been expended was dropped, and never revived. Now the expert is in a different position. It is not a question of the promotion of a huge company which would be the making or the unmaking of those responsible, but the expert is the consultant (with big ideas and visions for which there is not a substantial amount of corporeal authority) advising others. It is not a question of personal responsibility for money. Personal reputation, it is true, is at stake; but the whole project for the future, whatever may be its nature, and the correctness or otherwise of the forecast prompting it, is the responsibility of no less powerful an authority than the London County Council. There is not the slightest doubt that advice and project are throughout conscientiously based; but the advice and project of a couple of experts in a matter of such magnitude as this require very close examination by a number of other experts, and not mere laymen, before London is committed to a scheme of electrical revolution at an enormous expense, and most probably at the risk of the ratepayers.

We are not going so far as to say that the present position of the electricity industry in London is the ideal one, with its sharp and circumscribed territorial divisions. It is not. But the fact that this position exists must be taken as the starting-point for all consideration of the problem of the future supply of London, until 1931 comes, when the undertakings would, as fore-ordained, pass under the administration of the central authority if they take advantage of their rights, and a gradual transmutation of conditions and of supply might then be brought about without any great sacrifice and abnormal cost. A drastic and precipitate change, on the other hand, might be the worst possible happening for the electric supply of the Metropolis. Reduction in the price of current, the experts say, is the one thing needed for the development of the electrical service in London. But when the present average prices are compared with those obtaining in other important cities where concentration exists, there is not much to choose between them. This one fact alone should be sufficient to put the brake on precipitate action in the carrying through of the scheme proposed by Messrs. Merz and M'Lellan. It is a big scheme, and it involves a complete conversion. Amalgamation of the whole of the existing concerns, concentration of energy production (at a few stations on separate sites down the river), and standardization of distribution (by the existing low-pressure distribution networks not being extended, but supplemented by a new three-phase network). All this means heavy expenditure; and the ultimate object is a reduction of the price of current so as to develop the use of electrical energy in London.

Is there so much potentiality about the scheme within immediate years, in view of existing conditions, as is hazily hinted at in the report? All things considered, it hardly seems possible; and thus everything appears to point to the desirability of aiming at the objective of the report by a gradatory movement that would not have any adverse influence on the interests of London ratepayers. There is an outstanding capital outlay on electricity supply works in Greater London which in 1912 amounted to no less than £25,997,399. The initial capital outlay required for the scheme, allowing for the growth of demand during the next four years, Messrs. Merz and M'Lellan estimate at between £6,000,000 and £7,000,000. Only scrap value would be obtained for the plant discarded at the present generating stations, and probably about £1,000,000 would be realized for the abandoned sites. From this it is plain that, at the inceptive stage of the scheme, the total capital expenditure would be considerably greater than at present, and the increased capital charges would have to be met by the consumers, or, if losses resulted, by the ratepayers. Losses have resulted from the work of the Metropolitan Water Board. The intention of the scheme is to provide still cheaper electricity; but so far the conditions do not appear to be very favourable to this end. Various ways of endeavouring to give early effect to the plans are suggested. First of all a *sine quâ non* is the success of the very difficult work of uniting all the existing holders of electricity supply rights for the one common purpose. When satisfaction has been given to the shareholders that their full rights will be protected, and unity is attained, then the further task of centralizing the management has an important part; and Messrs. Merz and M'Lellan, we rather think, favour the idea of some co-operative scheme between a company and the governing authority—something after the Continental plan, under which the former pay over a fixed percentage of their profits to the latter. Experience on the Continent of such a form of co-partnership is that the consumers—at any rate, of gas—do not come off so well in the matter of price as they do under ordinary trading conditions prevailing in this country. The whole plan lends itself to making the profits as large as possible. Yet a cheaper price for electricity is what the reporters state is the requirement of London to stimulate the business. Between the means and the object, there is something that is hostile.

What are the chances in other directions of realizing lower costs? The cost of generating plant has fallen about one-fifth where large units can be employed; the average cost of production has also fallen to about one-fifth of its former amount; and the cost of lighting per candle power has been reduced (Messrs. Merz and M'Lellan say) to one-ninth of its former amount. These assertions show that the progress achieved has already largely curtailed the scope for further economies. Another doubtful point about the report (which, if an inflated view has been taken by the hyper-enthusiastic experts, may upset all hopes) is the "conservative estimate that in the near future" the present output of the London electricity undertakings will be multiplied by twenty. This is based upon the developments in other cities and in certain parts of London. To judge London by other cities and in piecemeal fashion is dangerous. The Gas Companies know from a large experience that there are few parts of London the composition of which is comparable, and certainly not from the point of view of the character of business to be done. The two reporters do not appear to have an intimate acquaintance with London from the local commercial standpoint; and therefore we are afraid that their conclusions in this matter are likely to be somewhat changed in the final result. They look, too, to London supplying a very fine field for domestic heating and cooking by electricity, if current can only be supplied at a sufficiently low price. They do not appear to say what is a "sufficiently

"low price;" and there is, of course, much virtue in an "if," especially when it is employed in a report of this kind. Besides the topographical conditions of London, we are inclined to the view that there has not been, in this matter of domestic use, sufficient consideration paid to the strength of competition. The knowledge of the reporters on this point is well disclosed to gas men by the clause referring to street gas lighting in the following extract from one of the appendices to the report: "As regards the demand for electricity "to-day, the domestic lighting demand shows steady growth "which will probably increase rather than diminish with "the spread of the use of highly economical lamps. As "regards street lighting, there have been great improve-"ments in connection with gas; *but as some of these supplies, "it is believed, cost the companies more than they receive for them,* "it is to be expected that electricity will be increasingly "adopted for street lighting, especially as the standard of "illumination increases, and the cost of producing electricity "decreases." This is evidence of how little Messrs. Merz and M'Lellan know of the position of competition, and which competition is an obstacle in the path of the easy and simple processes by which it is hoped to attain all the good things electrical that are predicted in the report before us. There is no question about it that, on paper, the County Council have got good value for their money; but it is after the paper stage that the real test of value is supplied, and that not in a short period.

Experience in the Water-Heating Business.

The makers of appliances for the utilization of gas for water-heating purposes are fully alive to the importance of keeping the subject well to the front, in both their own interests and those of the gas industry generally, which interests, mentioned separately here, are indivisible. Those of the makers cannot progress without those of the industry do the same; and *vice versâ*. The advertisements of the makers to-day (which set out in crisp manner the claimed good points regarding their appliances) are an evidence of an appreciation of the fact that water heating by gas promises them a very large field of business, just as the gas-fire does as winter approaches; and naturally they have all been very earnest in their efforts to bring their appliances up to a level of perfection and adaptability that will secure the favour of gas undertakings. For gas undertakings, there is also in such appliances a large and continuous business. We cannot look upon the water-circulator as a purely seasonal gas-consuming appliance, the same as the gas-fire. At one time of day, advertisements were seen which suggested that, when the kitchen range was not in use in the summer, for securing hot water a gas-heated water-boiler, circulator, or geyser was the one thing necessary in domestic economy and convenience. A gas water-heating apparatus in a house is something more than for seasonal service. It is complementary to the gas-cooker; and makes complete the all gas-heated kitchen and house, if only paterfamilias will in winter sacrifice the poker. Just as the gas-cooker, through its convenience, reliability, and quickness of action, has obtained largely an all-the-year-round use, so will the gas-heated water appliance, through its like attributes, be called upon to render the same continuous service. The convenience of a thing, its dependability, and its rapid action grow upon one; and at last the contributor to our comfort becomes indispensable.

There are some gas-supply areas in which gas-heated water-circulators have, in the initial stage of the business, obtained quite a large vogue. The cultivation of a business of this kind naturally requires time; but the highly satisfactory beginning that has been made in several places is of good omen for the future. It is not, however, a business that will grow unaided by gas undertakings, though there is no other labour-saving method of water-heating that can in any wise approach it. The coke-heated boilers with their constant service can claim a little lead in the matter of economy. But gas heads the coke-boiler in labour-saving; and we are afraid this is why the latter will not make the same progress as its gas-heated rival, except perhaps in large business and manufacturing establishments. However this may be, the experience of the last few years has disclosed the essentials for the proper cultivation and maintenance of the business in gas-heated circulators. The case for them is easily presented to the householder by the local gas undertaking. The meritorious points of the system are several; and they are of a kind that householders can and will appreciate. They do not need specific mention, except that they may act as a reminder to the managements of gas undertakings who are embarking upon the business for the first time. Labour-saving is a strong point with which to lead off; convenience and availability are good second considerations; the promptitude with which hot water can be obtained to meet a bulk requirement stands well in the list of advantages; fitted with a thermostat, there is economy for the householder where hot water is frequently required; as labour is saved, and as there are no stand-by charges if only intermittent supply is needed, and therefore intermittent heating is resorted to, there is a very definite economy for the ordinary household; the gas-heated circulator, too, is a very compact thing in its modern forms, considering the amount of work that it will do. But with all these advantages, the middle-class householder, whatever the upper class may do, will not be tempted to buy outright and have fitted these gas-consuming conveniences, save in rare cases. Yet for the gas undertaking they are a good line, and should now be added to the other business without further hesitation. It comes to this, that the appliances must be let out on hire by gas undertakings. Many are already doing this, and at very reasonable rates, finding that it pays to get them adopted. One instance that we came across only last week was an offer by a gas undertaking of gas-heated circulators at 2s. 6d. or 3s. per annum, according to capacity. This is a very attractive rent; and a good gas consumption from water-heating should arise in the area of that concern.

Experience of the business teaches us other things. The next is that there should be very critical local and independent tests made of the gas-heated water-circulators of the various makers before making selection. Of course no one would think of breathing a word against the chaste honesty of the several makers; the goods of each one have naturally all the virtues that a conscientiously acting circulator could possibly possess. No one says anything to the contrary. Yet we would counsel critical tests, quite apart from all the representation of progenitors as to good character. All the makers have now had sufficient years of experience in the construction of these appliances to turn out excellent goods. There are several new types on the market; they are mostly strong and of low price. Durability and reasonable cost are very essential in view of letting on hire and subsequent maintenance costs. The fewer joints there are, the fewer will be the seats for weakness and leakage. The boilers should be fitted with a good thermostat. It is imperative that, in those districts where the water is of a nature that will have a corrosive influence on metals, or is of a calcareous character, very careful choice should be made of the water-heating appliances to be installed. For letting on hire and maintenance, it is an indispensable condition that the material of which the boilers are constructed must have good life; and where there is likely to be formation of any deposit, there must be ample means for cleaning *in situ*. Cleaning must be done at regular intervals, in order that there may be little depreciation of efficiency. Another suggestion is that, in the cause of a good heat efficiency, as much of the heat as possible should be recovered from the products of combustion, because the extent of popularity must rest largely upon the cost of doing any given amount of work, though the collateral advantages are of such importance that, in the better class houses, they alone are sufficient to secure adoption. When ascertaining the efficiency of water-circulators, we have counselled making independent tests. There are some circulators that will give satisfactory efficiency if a bulk of low-temperature water is all that is needed; but when one comes to high-temperature water, the efficiency is not of anything like the same order. We have seen boilers under test, and as a proof of a high-temperature water efficiency only a small quantity of water has been drawn off from the top. But when the water has continued to flow, there has been a remarkable drop in the temperature registrations. A drop would be expected; but not such a precipitate one as has been experienced in certain cases. In a household one requires both high-temperature and low-temperature water; and to test relative efficiency, one wants to go through the whole business from gas consumption to a temperature test over a period at a tap, and tests of the bulk of water run off.

Experience teaches us that there is yet another salient point that must be observed by the managers of gas undertakings. When Mr. A. E. Broadberry read his paper on the subject of water heating at the last annual meeting of the

British Commercial Gas Association, we remember the remark of Mr. F. W. Goodenough, that the hot-water problem is a different one for every house, and that generalization is not of very much value. We also rememember Mr. W. J. Sandeman saying, on the same occcasion, that in Croydon the Gas Company have found it necessary to start a hot-water department, with a man specially trained to supervise it and the work. These two statements have a natural sequence—the one pointing to a need; the other to the means for the fulfilment of that need. If this hot-water business is not going to be thoroughly well done, then it had better be left rigidly alone. It is no use setting up apparatus anyhow. The installation of a hot-water system will not submit, if good service is demanded, to any rule-of-thumb or second-rate methods. Each case has to be systematically studied; and after installation, there must be maintenance. Hot water is the object, with as little heat loss as possible throughout the system, and there must be economy in it. We have known more than one installation made by gas-fitters that has produced considerable trouble and dissatisfaction; and consultation with an expert has been required to set matters right. There has been inappreciation of the fact (and it must not continue) that the gas-fitter, skilled as he may be with burners, cookers, and gas-fires, may not be the slightest good, without special training, for dealing with hot-water work. Proper installation cannot be obtained without proper experience; so that an essential is thoroughly trained men—at any rate, to plan and to supervise each installation—if satisfaction is to be obtained, and if the cost of installation and of realizing satisfaction is not to be prohibitive. The skilled hot-water engineer will tell one that his work is continually beset with new problems, which only experience can solve. Therefore each gas undertaking should see to it that at least one of its men is thoroughly trained in hot-water apparatus and its installation, so that he can train others and supervise their work. If this is not done, however good a selection has been made from the various types of gas-heated water-circulators on the market, they may be rendered inefficient by bad location and want of knowledge as to what is necessary under a given set of conditions. Experience dictates that attention must be given to these matters; and, that attention bestowed, a large popularity for the gas-heating of water is assured.

Scrapping and Improvement in Public Lighting.

In a paper that Mr. F. Victor Westermaier, of Philadelphia, read before the Illinois Gas Association at the annual meeting, he describes some tests made in connection with street lighting, which demonstrate the largely increased illumination that can be obtained from higher power gas units by a moderate consumption of gas above that of the ordinary standard lamps. In the opening of his communication, he deplored the fact of an existing lack of encouragement on the part of both gas suppliers and local authorities in effecting improvement in public lighting by the modern means furnished by gas. The word "enterprise" would have been better than "encouragement." The complaint that he makes in regard to America applies to a considerable extent, and with equal force, to this country. The street-lighting service is in many places the most unprogressive of all public services. There are some districts where much has been done in the way of improvement; but this unfortunately is the exception rather than the rule. Early Victorian forms of lamp-posts and lanterns still reign extensively; and makers of lamp-posts keep largely to the antiquated designs and heights. Some were visible at the National Gas Exhibition last October. The burners that are in the majority are those that obtained in the early days of incandescent gas lighting. It is the existence of these conditions that gives our electrical competitors greater scope in engaging the ear of local authorities. The art of scrapping in connection with public lighting has not advanced with the same rapidity as in connection with industry and with some other branches of public service. The horse trams have given place to electric trams; horse traction generally has had to give way to the motor. But, though, through traffic changes, a higher standard of illumination is required in our streets, there has been a large reticence in giving effect to it, excepting in certain areas—too many to be named, but still forming a comparatively small proportion of the whole.

It was Sir George Livesey who first demonstrated the necessity of scrapping in connection with street gas-lamps, and that to effect this there must be conjoint action between gas suppliers and local authorities. His system was simply to take advantage of the improvement in the efficiency to be obtained by the then modern means of gas lighting; and to utilize the savings effected between the old form of lighting and the new in meeting the expenditure incurred in the provision of more artistic standards and lanterns and higher efficiency burners—the public deriving as their share in the transaction the improvement in illumination and in the appearance of the streets by the neater and more ornamental type of standards and lanterns. In considerable areas of Northern London, too, through the progressive action of the Gas Light and Coke Company, and the terms held out to local authorities to tempt conversion, a remarkable change has resulted in late years—all through co-operation, and the adoption of modern methods. New and long contracts for gas lighting have been made; for, though improvement costs money, it can be effected at a far lower cost, with a greater resulting efficiency, than by the competing electricity. We might name several towns where the same thing has been done. But it comes to this: There must be—at any rate gradually in more frequented roads—scrapping, and there must be improvement, and the economy resulting must be partly devoted to this end. The coming summer would be an excellent time to see what can be accomplished in this direction, and to try to secure revision of contracts. It is always best for the initial move in this matter to come from the gas suppliers, and not to wait until dissatisfaction with the public lighting has taken deep root, through comparison with what is done elsewhere, or through the secret advances and representations of the electric light suppliers. There is a good deal of initiative work waiting for gas suppliers in this connection, and not only in the main streets. In the principal ones there is no question that the electricity people will try to gain ground by the use of the so-called "half-watt per candle power" lamps, which are nothing of the kind, since the candle powers of the units do not (so far as they have been photometrically tested) come up to the nominal descriptions that have been conferred upon them by their makers. On this account, they are not to be ignored; their efficiency in the high-power units is much greater than that of the preceding metallic filament lamps. Seeing, however, that neither the claimed nor the actual efficiency comes up to that of the electric flame arc lamp, and that high-pressure gas lighting can give a higher duty than the flame arc from all points of efficiency required of a street-lighting agent, there is nothing to fear; but the reasons increase for a larger use being made of the highest efficiencies of modern gas lighting in street illumination.

However, America has done little in the way of the adoption of high-pressure gas-lamps for street purposes; while in this country a fairly considerable use has been made of the system. What Mr. Westermaier has done has been to show by demonstration how vastly street illumination can be improved by a moderate additional gas consumption, with higher power units, at ordinary pressures; and he did this by employing portable lamp-posts, the heights of which he could adjust to get the best distribution with different power units, with the lamps fitted and the glasses obscured just as he considered most appropriate. With some of the forms of globe obscuration that he adopted, we are not (owing to the large light adsorption) quite in agreement, although freely willing to say that the effect of partial lower obscuration of the globe upon light distribution with suitable reflectors has not, in the case of gas-lamps, been studied to the extent that it should be. The portable lamp-post system, with independent gas-supply pipes run along the kerbs, enabled comparisons to be made by the public with the lighting by the old lamps.

The main point is Mr. Westermaier proves his case. With single inverted mantle lamps, fixed 13 ft. high, he obtained a gain of 152 per cent. in minimum candle power, and an increase in the average illumination of 107 per cent., with an increase in the gas consumption of only 42·8 per cent. The experimenter appears to have a preference for upright mantles, which is contrary to experience in this country, where some of the best contracts have been secured through the use of inverted gas-burners, owing to the less waste of light upwards, and the larger amount brought into useful service in the lower hemisphere. However, with double upright-burner lamps, 13 ft. 8 in. high, the minimum illumination in the street was raised 274·2 per cent., and the general average illumination by 295·5 per cent., with an increase of 100 per cent. in gas consumption above the ordinary standard quantity. By some larger units, fitted with inverted mantle clusters, the minimum illumination was raised by 694·5 per cent., and the general average illumina-

tion by 559 per cent., with an increase in consumption above the ordinary standard lamp of 288 per cent. However much we may disagree with the suitability for obtaining the highest effects of the fitting of some of the lamps with which the experiments were carried out, this much can be said, that the author demonstrated very completely, accepting his figures as being accurate, that there is no equal relationship between the increased illumination obtained in streets and the increase in gas consumption (at low pressure) required to obtain the higher illumination—that is to say, from a given percentage increase in gas consumption, the percentage increase in minimum and average illumination is greatly in excess. The difficulty, however, is to get local authorities away from the craving for public lighting being done for less and less money, instead of giving the public additional value in the improved lighting of the streets for the same money or very little more.

Trench Excavations by Machinery.

A NEW subject for the consideration of distributing engineers in this country is that of the use of machines for the digging of pipe-trenches; but we are afraid that, at the present stage of the construction of machines for such work, and in view of the limited application they could have in this country, except in carrying pipe-lines through outlying areas, progress to adoption will be arrested at the point of consideration. The subject was discussed in a paper read by Mr. C. B. Strohm, the Engineer of the Western United Gas and Electric Company, at the recent annual meeting of the Illinois Gas Association. So little has the question of machine trenching been under notice in this country that, so far as we remember, gas text-books do not touch upon it; the whole information given referring to hand work, which will continue the vogue in this country for several reasons. Mr. Strohm, in our opinion, does not make out a very strong case for these machines. They appear to be fearfully and wonderfully made, as well as cumbersome; and, added to their complication and weight, considerable horse power is required in order to make them fit any set of conditions under which they may be called upon to operate. They work at their best on nearly straight lengths of level roadways; but a good operator can make them take fairly sharp curves. They cannot be efficiently used on all roads on account of the variation in levels; a sloping road being very difficult to negotiate. The ground must not be too moist, or the operating parts of the machine will become clogged. There is also the restriction to open roads. In the paved streets of our towns, the machines would not be of any use; where the streets are not paved, but the subsoil is thickly occupied by pipes, cables, and sewers, &c., a machine of the kind would play sad havoc. The limitations are therefore many. Where the machine is working under propitious circumstances, and can have its full fling, the various types claim to excavate at the rate of 2 to 6, 7, or 8 feet per minute. At this rate, in this country, the length of trench opening that the Legislature permits at one time in a district, where restriction has been imposed at the instance of the road authorities, would soon be exhausted.

Mr. Strohm bases his advocacy principally on the question of economy; and there again we do not think he makes out a case that will tempt on this side. There are explanatory details missing; but we must take the figures as they are presented. The author does not think it would pay to buy a trenching-machine for a job of less than 15 miles; and the price would be about $5000. Of course, the price of excavation work depends on the nature of the soil in which work has to be done. The author gives 2·84 c. as the average cost per foot of machine trenching that he has carried out—for 8-inch pipe, it was 3·83 c., and for 4-inch and less pipes, 2·62 c. The author estimates that per foot the cost with hand work would have been 7 c.; so that it may be taken that his estimated saving by machine work is about 4 c. In 15 miles, there are 79,200 feet; so that a saving of 4 c. per foot would amount to $3168. In the costs of operation, the repairs are, next to the operator's pay, the heaviest item in the amounts that go to make up total expense, which is just what would be expected, having regard to the character of the machines and of the work they have to perform. Despite the heavy cost for repairs, the general depreciation must be considerable, inasmuch as Mr. Strohm reckons that, after doing the 15 miles work, the machine, which has cost $5000, would probably fetch something like half price. There is the risk of not being able to find a buyer. If one cannot be found, and the machine has to stand and depreciate in idleness rather than in work, the 15-mile job might work out more expensively than hand work. Supposing half price could be realized for the machine, then, deducting the balance of the capital cost, $2500, from the $3168 saved by the machine work compared with hand work, there is a net saving of only $668 to spread over the 15 miles of work, or less than 1 c. per foot. When the risks of not being able to sell a depreciated machine are considered, as well as the liability to breakdown, which would occasion public inconvenience, together with the limitations of the machine, we think preference will generally incline to hand work, and the provision of employment for unskilled labour.

Dublin Figures, and the Question of an Expert.

There is in our "Correspondence" columns a trenchant criticism by Mr. H. E. Jones of certain features of the accounts of the Alliance and Dublin Consumers' Gas Company; and he there calls attention to certain past suppressions in connection with figures on the part of someone. Into this charge the new Directors ought to seriously inquire. The misinformation has, it appears, extended to "Field's Analyses," in which all gas men place the fullest reliance. Dublin has been a blot on them. The fault is not that of the Editor of the valuable statistical publication; he has only been able to deal with the information placed before him. But it certainly ought to be a point of honour on the part of all who furnish information for the purpose of publication in a standard work of this kind that it should be absolutely free from any misrepresentation. The same thing applies to figures furnished to shareholders. Regarding the point raised in Mr. Jones's letter, as to the presence of Alderman W. F. Cotton on the Board of the Company, we have been careful, in writing on the subject of placing an expert on the directorate, to emphasize our meaning as being an expert in modern technical and commercial affairs. The times have greatly changed since Alderman Cotton was an active gas official; and he has since largely devoted himself to matters other than gas engineering and the technical problems of manufacture. He himself would be one of the last to presume to give expert advice on many current technical gas matters. We have deliberately kept Alderman Cotton's name outside previous comments, because of the fact that we did not feel that, in view of weaknesses in the undertaking that are visible to the expert in modern gas affairs, he would to-day claim, nor wish his friends to claim for him, the title of "expert." We are sure that, knowing well our old friend, any such claim is not his wish, and that he will not regard our remarks as in any way disrespectful. As a matter of fact, on this point of a gas expert, Alderman Cotton is a member of the Board; but Mr. F. J. Dickens, in his acknowledged innocence of gas affairs, has pronounced his personal preference for not having an "expert" as a directorial companion. Apparently he has no objection to Alderman Cotton on this score.

Smoke Abatement Abroad.

In many matters we are accustomed to being told that this country has much to learn from Germany; and now it seems the same assertion is to be met with in the case of smoke abatement. At any rate, the statement is put forward that the Manchester and District Smoke Abatement League are at the present moment taking steps to organize local manufacturers into a society on lines similar to one which has done much good in Hamburg. In that city, we are told, there is a League which was established nearly twelve years ago by a few manufacturing firms who banded themselves together to form an entirely voluntary organization of steam users having for its object the rendering of their plant more efficient and less smoky. Both are desirable ends to aim at; and each is connected closely with the other. Evidently, the League "caught on;" for the membership roll now embraces close upon 500 firms controlling over 1700 boilers, and there are engaged in its work four engineers and six stoker instructors. Steam plants are tested, and reports submitted containing suggestions as to improvements which should be made; and any apparatus which is likely to be beneficial to the members is reported upon. Perhaps an even more important branch of the work is the special instruction which is given to stokers. How necessary this is may be gathered from the statement that it is frequently found that,

after the stokers have been trained, the average efficiency of the plant will be increased 5 per cent. or more. Investigations are also carried out with reference to the different qualities of coal and other fuels available, and members are advised as to just what it will be most economical for them to use. The alternative to some such line of action as is here outlined is, the Manchester people point out, prosecution on the part of the local authorities; and they rightly regard what is done in Hamburg as much the better policy of the two. It may be mentioned that it is not suggested that the new organization should be confined to Manchester, but that it might in all probability have its headquarters there.

A Settlement in Yorkshire.

After having been on strike for a fortnight (so far as the whole county was concerned), the Yorkshire miners, on being balloted early last week, decided by an overwhelming majority to accept the terms of settlement suggested by the Conciliation Board. The proportion who voted out of the total of 170,000 workers at the pits in the county, was very small; but of those who did do so, less than one-third opposed the ending of the strike in the way suggested. It was, of course, holiday time generally; and many of the men had no doubt temporarily left the district. However, once the result was known, no time was lost in fixing-up meetings to make arrangements for re-opening the pits; and a general resumption of work was anticipated as from the beginning of this week, with an almost immediate fall of coal prices to normal rates. The strike appeared from the first to fail in the arousing of the enthusiasm which is so helpful, if not absolutely necessary, to the successful carrying through of such an attempt to enforce demands as a general abstention from work; and the news of a settlement—always welcome to the wives and children, who must be the greatest sufferers in industrial warfare—was probably received with a feeling of relief by even more of the men than cared to show it. The settlement has established the principle for the district of a different minimum for different classes of mines; and the delegates to the Conciliation Board Joint Committee expressed the opinion that the agreement arrived at will mean a much smoother operation of the Minimum Wage Act in the South Yorkshire coalfield. If this simplification should prevent disputes in future, the advantage may not have been secured at too great a price. But the struggle has been a costly one; the amount of strike money alone paid out in the county being reckoned at about £200,000.

PERSONAL.

We learn that Mr. R. G. Luxon, the Assistant to Mr. James Armstrong, the Manager of the Ilfracombe Gas Company, has been appointed Manager of the Launceston Gas Company.

Mr. Alfred E. Ruffhead, Assoc.M.Inst.C.E., who for the past two-and-a-half years has been Engineering Assistant to Mr. Frank P. Tarratt, the Engineer and Manager of the Darlington Corporation Gas-Works, has now been appointed Assistant Engineer and Manager, in place of Mr. R. W. Nicholls, who has recently taken up the position of Manager of the City of Durham Gas-Works.

Mr. Stanley C. Butler, who has been a member of the Eastbourne Gas Company's staff for the past eight years, has been appointed upon the staff of the Cheltenham Gas Company. His colleagues met last Saturday week and, by the hands of the Secretary (Mr. James S. Garrard), presented him with an English lever watch as a parting gift. Mr. Garrard spoke of the very happy relationships existing among the members of the staff, to which Mr. Butler had invariably contributed. In the name of the Directors and of the staff, he wished Mr. Butler every success, coupled with the heartiest congratulations upon his appointment. Mr. Butler, in returning thanks, spoke of the kindness he had always received from the various contributors.

Marriage.—Last Wednesday, at Christ Church, Forest Hill, Mr. Leonard G. Barber, Assistant at the Cambridge Gas-Works, was married to Miss Mary Gladys Shoubridge, the elder daughter of Mr. and Mrs. Sydney Y. Shoubridge. The bride's father is the Engineer of the South Suburban Gas Company. After the ceremony, a reception was held at the Hamilton Hall. Among the presents received by the bride and bridegroom were a handsome silver tea service from Mr. Charles Hunt, the Chairman of the Company, and presentation silver from the engineering staff and foremen.

MR. CHARLES MEIKLEJOHN.

An Appreciation and Record.

The streets of Rugby were on Thursday morning bathed in the purest and richest of sunshine. It was a morning on which, in ordinary circumstances, one and all who walked the streets of this famous scholastic town might have felt joyous. It was such a morning when one who had walked the streets almost daily for well over a score of years, and had worked for the residents and the Company to whose interests he was so earnestly devoted, would have been at his best. But many were the little knots of men who passed up the main street, either to "Craigside" or to the Parish Church, who, with sun and brightness about them, were heavy of heart, and, when their lips moved, it was invariably to talk, and open the store of memories, of a lost friend—one whose friendships in the industry to which he belonged, and which he served so well, were universal. Easter Sunday—a day of Christian rejoicing—threw the home at "Craigside" into grief and mourning. Charles Meiklejohn was on that day gathered to his fathers; being only 56 years of age. Such a sudden end was not anticipated, though our friend had been seriously ill, and had for a number of years had periodical collapses in health. But nearly to the end the old vivacity, the old jocund spirit, which endeared him to all men, rose above physical weakness.

Men came from near and from far on this Thursday when Charles Meiklejohn was to be laid to his final rest. What was it that made men in great numbers desire to pay their last tribute of respect, to be present, with solemn thought and with a deep sense of loss, when the mortal remains of one who had worked with and among them were carried from home to church, from church to cemetery, and there at the end of the last journey silently and reverently removed from the surface of the earth which he had in life helped to brighten? It was nothing but the fullness of affection that one man can possibly bear to another—an affection born of a friendship woven by a magnetic personality and loyalty. Some men draw to themselves friends and admirers by the greatness of their work, by creative genius, by notable successes in one form or another. Charles Meiklejohn did not claim to be great as an inventor, nor did he seek recognition for anything that could be spoken of as remarkable, as things are classified "remarkable" by this present-day world of ours with its high standards in all walks and work. Yet he was a man among men. His vivacity, his sociability, his transparent honesty of purpose, his keenness for what he believed to be the right path in all things, his generosity in all matters that arrested his interest, his solicitous care for young men (as witness his attachment to the Midland Junior Gas Association) and for workmen, and his fidelity to trusts conferred or self-recognized—whether in connection with the Company to serve whom he deemed it an honour, in connection with the Midland Association, in connection with the work of the Institution of Gas Engineers and especially of the Benevolent Fund, or in connection with Masonic charities—were of the characteristics (feebly expressed here) of a composite nature that makes a man beloved of men. We knew him in his home life, in his work, in his travels from home—nothing but ill-health wrought in him any change, and then but temporarily.

The gloom of loss deepened as relatives and a few personal friends met at "Craigside," and followed him with whom they had been so intimate to his last mundane home. Among the chief mourners were his nephews, Mr. R. J. Meiklejohn (Rugby) and Mr. John Meiklejohn (Yorktown and Blackwater Gas Company), Mr. J. Watson (father-in-law), Mr. J. T. Watson, Mr. D. L. Raitt and Mr. W. H. Keel (brothers-in-law). Among the friends who accompanied them were Mr. A. C. Scrivener, Mr. Walter King, Mr. Harold G. Eveson, Mr. F. Jervis, Mr. W. Charlton, Mr. H. Richardson, and Mr. A. F. Bezant. On the way to the Parish Church, one could not avoid observing the signs of the great respect in which our deceased friend was held by all among whom he had lived and worked.

In the Parish Church, there was already a large assembly. The nave of the church was filled with mourners. But what a setting to the hour and the occasion! The floral decorations of Easter time remained—the emblems of rejoicing, and fit emblems of the spirit of the man whose loss all deplored. He who loved his garden would have asked for the presence of nothing better, could he have had the choice, in the sacred resting-place on his last journey. The coffin rested in the chancel, every knee was bent, every head bowed. There was a death-like pause; and in the silent moments thoughts were concentrated. Then there came the first part of the service. At the end, we passed from the sacred edifice; and slowly the carriages wended their way through the streets to the cemetery. At the back of the carriages, four abreast, tramped men old and young, and of varied estate. The procession was long. In carriages or on foot were the Directors of the Rugby Gas Company: Mr. A. G. Chamberlain, Mr. A. J. Elkington, Mr. J. B. Gray, Mr. B. Haynes, Mr. L. Loverock, Mr. W. Howard, and Mr. J. Watson. There was also the Secretary of the Company (Mr. T. M. Wratislaw) and the Assistant-Secretary (Mr. M. E. T. Wratislaw), with most of the staff and the workmen. Local government and organizations were largely represented—among them the County Council, and the District Council. The London and North-Western Railway Company and the Midland Railway Company were also represented. Among those noticed from the Midland Association were: Mr. W. J. Rendell-

Baker (the President), Mr. Vincent Hughes, Mr. A. T. Harris, Mr. W. H. Adams, Mr. W. R. Cooper, Mr. James Duff, Mr. Fred. J. North, Mr. W. M. Valon, and Mr. W. G. S. Cranmer (Hon. Secretary). Unwell, and staying at Sidmouth, Mr. Thomas Berridge was, to his sorrow, unable to be present. Also noticed was Mr. Rae P. Normand, Secretary-Elect of the "Evening Star" Chapter, who brought a magnificent wreath on behalf of the "Evening Star" Lodge and "Evening Star" Chapter. Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers (also of the "Evening Star" Lodge No. 1719), was there. Mr. F. G. Swinden, P.D.G.S.B. England, Prov. G. Secretary, was present. The "Murdoch" Lodge was represented by Worshipful Brothers A. T. Harris, Vincent Hughes, Luke Taylor, and Fred Vale, as well as by Brothers A. C. Scrivener, F. Jervis, James Duff, F. Withers, Robert Scott, W. M. Valon, W. R. Glover, W. J. Rendell-Baker, W. Charlton, and Harold G. Eveson (Secretary). Quite a considerable number of the Lodge of "Rectitude" (Rugby) also attended. In private capacity there were present Mr. J. L. Baird, M.P. for the Rugby Division, Mr. A. E. Donkin, Mr. Freeman Burrows (who also represented Mr. W. Edgar and Mr. Henry L. P. Allender), and others too numerous to mention. Local friends were in great force—even friends of the earlier days in Oldbury and from other of the scenes in which the life of our friend had been cast. They were all there purely from their own personal desire.

At the graveside, the service was resumed; the large assembly standing with heads bared and given over entirely to the solemnity of the hour. Over the scene the sun shone brilliantly. The voice of the clergyman only disturbed the stillness. The last words were uttered. Then there was a movement to the graveside. Sprigs of acacia were scattered by many hands on the coffin. We left our friend lying under the unclouded blue canopy of heaven, the golden sunlight filling his grave, and the rays scintillating from the polished brass plate on which were inscribed the words: "Charles Meiklejohn, Born 21st June, 1857; Died 12th April, 1914."

There were over seventy wreaths. In addition to the family wreaths (among others) were those from the Directors of the Rugby Gas Company, the works' officers and men, the clerical staff at the offices, the workmen of the Yorktown and Blackwater Gas Company, the Midland Association of Gas Managers, the Rugby Urban District Council, the Rugby Conservative Club, the Rugby Division Conservative Association, the "Murdoch" Lodge, the Lodge of "Rectitude," the Chapter of "Rectitude," the Rugby Scottish Society Lodge, and the Brethren and Companions of the "Evening Star" Lodge and Chapter, and the Earl of Denbigh.

Mr. Meiklejohn was a Scotsman, having been born at Shotts, in Lanarkshire, in 1857. In his early days his parents went to Ireland, and his father became the Manager of several gas-works, those of the Portadown Gas Company being among them. On completing his school course, he obtained a situation under the Company, and remained with them till 1872. Three years later his father returned to England to take the position of Manager of the Houghton-le-Spring Gas-Works; and his son accompanied him as his assistant. The condition in which they found the works was described by the late Mr. Robert Dempster, of Penmaenmawr, in an article which appeared in the "JOURNAL" for May 17, 1904; and although subsequent correspondence in our columns put a somewhat different complexion on his story, it was evident that Mr. Meiklejohn, sen., had a hard task before him. With Mr. Dempster's assistance, however (which was willingly given), he surmounted all difficulties. He is described as "a downright honest, persevering gentleman, who had only to be known to be respected."

While engaged as assistant at Houghton-le-Spring, Mr. Charles Meiklejohn had a rather serious illness, on recovering from which he accepted the position of Manager of the North Berwick Gas and Water Works. He was, however, compelled to relinquish it, as his health again gave way, and complete rest was advised. But he did not long remain unoccupied, for he obtained an appointment as Superintendent at the Darlington Corporation Gas-Works, under Mr. William Smith, the then Engineer. After a year's work there, he entered the service of the Colombo Gas Company as Assistant-Manager, and stayed with them till 1884, when he asked to be released from his engagement. On his return to England, he was appointed Gas Manager to the Oldbury Local Board, and held the position till 1892, when he was selected, out of a large number of applicants, as the successor of Mr. Peter Simpson as Engineer and Manager of the Rugby Gas Company. Evidence was soon afforded by the new Manager that the Directors had chosen the right man; and they not only placed entire confidence in him, but showed in a substantial manner their appreciation of his efforts on behalf of the Company. He had studied gas manufacture and allied subjects, and had obtained many awards; so that he was thoroughly qualified for his position, and under his supervision the works were extended and improved.

During the time that Mr. Meiklejohn was Engineer and Manager of the Company, the business progressed exceedingly. In the year when he took up his duties (1892) the share and loan capital amounted to £38,901; last year it stood at £59,327. The coal carbonized in the respective years was 7267 tons and 16,637 tons; and the sales of gas amounted to 67,562,100 cubic feet and 185,737,400 cubic feet, so that the business had nearly trebled itself. The balance of profit and loss account in 1892 was £4627 and in 1913 £15,706. The insurance and reserve fund amounted in 1892 to £3461, and in 1913 to £6861. The price of gas in the former year was 2s. 10d. net, and last year 2s. net. The dividend in 1892 was 11 per cent., and in 1913, 14½ per cent. and 11½ per cent. The co-partnership system was, on Mr. Meiklejohn's advice, introduced at the works in 1908. Thus it is seen how consumers, shareholders, and employees have all shared in the prosperity that the late Manager helped largely to create.

Mr. Meiklejohn joined the British Association of Gas Managers while at North Berwick in 1881, and passed into the Gas Institute; but he left it in 1894 to join the first Institution of Gas Engineers, of which he was elected a member of the Council in 1900. On the amalgamation he went into the present Institution, and was upon the first Council. He did yeoman service in advocating the claims of the Benevolent Fund; and his successful work was more than once acknowledged. He was last year elected a member of the Committee of Management.

While at Oldbury, Mr. Meiklejohn joined, in 1885, the Midland Association of Gas Managers, and at the spring meeting in 1890 he read a paper on "The Recovery of Sulphur from Alkali Waste," for which the President (Mr. H. Peaty, of Burslem) expressed his personal thanks, and which gave rise to a good discussion at the last meeting in the year. Mr. Meiklejohn was an Auditor of the Association, and was elected Hon. Secretary in 1891, in succession to Mr. J. S. Reeves, of Bilston. He relinquished the position, however, at the end of 1901, when the duties were undertaken by Mr. Adam Cooke, of Oldbury. He was President in 1903; and an interesting feature of his address was a tabular statement of the results achieved at Rugby in 1892 and 1902—the first and tenth years of his work there. He carried out considerable extensions of the gas-works, which were inspected by the members on the occasion of their excursion meeting in the above-named year. He resumed the secretaryship in 1904, and held it till early in 1909, when he resigned, and was succeeded by Mr. Harold E. Copp. Referring to the matter, the President (Mr. W. Langford) compared the position of the Association then and at the time Mr. Meiklejohn took office. At the former date the membership numbered 66, at the latter it was 112; the credit balance at the bank being £70, compared with £119. But for a special donation of £26 to the Benevolent Fund of the Institution of Gas Engineers, the latter sum would have been £145. The President added that Mr. Meiklejohn had "completed seventeen years of constant service ungrudgingly given, and in such a manner as to have earned and obtained the highest esteem of every member." A cordial vote of thanks was accorded to Mr. Meiklejohn; and it was left to the Committee to take further steps in the matter of a suitable recognition of his services. The outcome of their deliberations was the presentation of a testimonial, in the form of a handsome silver tray, suitably inscribed. This took place on the occasion of the visit of the members of the Association to the Potteries district in the spring of 1909, when they were the guests of the late venerable Mayor of Longton (Alderman Aaron Edwards) at a dinner in the Town Hall. The presentation was made, as representing the members, by Mr. Langford, who said he was pleased it had fallen in his year of office. Mr. Meiklejohn, in acknowledging the gift, expressed his deep thankfulness to the members for their great kindness. He said that he should cherish the memento, not only for its intrinsic value, but for what it represented in their thoughts and the kindly feeling, sympathy, and goodwill towards him of which it was the evidence.

The duties and responsibilities of Mr. Meiklejohn's position with the Rugby Gas Company in time affected his health; and in the spring of 1904 he was ordered by his doctor to take a trip with the object of effecting some improvement. He accordingly started, accompanied by Mrs. Meiklejohn, and with the heartiest good wishes of his Directors and those of his friends who knew of his departure, for a six weeks' cruise in the Mediterranean. The itinerary was a comprehensive one—including Marseilles, Naples, Pompeii, the Straits of Messina, and across the Adriatic to the Gulf of Corinth. Athens, the Dardanelles, Constantinople, and Palestine were visited; and some days were spent in Cairo and Luxor. He returned greatly benefited, and strongly recommended the trip to "worried gas managers."

Early last year, Mr. Meiklejohn was elected a member of the Warwickshire County Council. He was also a member of the Urban District Council, and Honorary Treasurer of the Rugby Division Conservative Association. He was a prominent Freemason. His record is that of a founder of the Godson Lodge (Oldbury), a founder and first W.M. of the Murdoch Lodge 3480, a P.M. of the "Rectitude" Lodge 502, a member of the "Evening Star" Lodge, a P.P.G.S.W. (Warwickshire), and First Principal of the "Evening Star" Chapter. He was a keen supporter of Masonic Charities, and Vice-President of the Masonic Benevolent Institution for Girls.

Mr. Meiklejohn married, on June 18, 1896, Miss Minnie Mary Watson, daughter of Mr. and Mrs. Joseph Watson, of St. Helens, South Hampstead. Among the numerous presents was a silver tea and coffee service (of the same pattern as the tray already referred to) from the members of the Midland Association, as well as other tokens of the esteem in which he was held in the gas industry. His colleagues in the profession, more especially those engaged in the Midlands, will miss a thoroughly efficient and conscientious member, and his personal friends a large-hearted, companionable man. Two children share the deep grief of the mother, who has a large number of friends in the industry whose sympathy is with her in these darkened hours.

THE LATE MR. ALEXANDER ALLAN.

In the last number of the "Journal" we briefly recorded the death, on the previous Sunday, of Mr. Alexander Allan, the Engineer and Secretary of the Scarborough Gas Company. The sad event came rather suddenly. He was fulfilling his duties a few weeks ago, and was out walking with his son on the 29th ult. He was taken ill next day, and an operation was ordered. To this he unfortunately succumbed in a nursing home.

Mr. Allan was apprenticed to Messrs. Henry Balfour and Co., of Leven, Fife, and while in their service had the supervision of the erection of gas-making and other plant in different parts of the world. In 1880 he obtained the position of chief draughtsman to Messrs. Alfred Williams and Co., of Bankside; and subsequently entered the service of Messrs. Joseph Quick and Sons in a similar capacity. In 1883 he was appointed Assistant-Engineer to the Edinburgh Gas Company, and was with them for two years. He then obtained the position of Resident Manager of the Bankside station of the South Metropolitan Gas Company, and held it for four years. He left the Company's service to take the management of the Effingham Street works of the Sheffield Gas Company; being subsequently transferred to the Neepsend works, of which he had charge for some years. Towards the close of 1898, he obtained the post of Engineer to the Chester Gas Company, in succession to the late Mr. Robert Hunter, but subsequently decided not to leave Sheffield. About a year later, however, he was selected, out of 49 applicants, to fill the position of Gas Manager to the Nelson Corporation; and on leaving Neepsend, he and Mrs. Allan were the recipients of testimonials from the staff and employees. His management of the gas undertaking at Nelson was attended by the best results. The year before he took charge of the works, the Gas Committee had to report to the Town Council a deficit of £800; but the change of management was so effective that in twelve months the deficit was converted into a net surplus of £3000, and at the end of the last year he was there a profit of £8000 was shown, or a net profit of £5000 with £3000 deducted as the cost of illuminating the public streets. This result was obtained by sound economy, a practical knowledge of what was required, good organization, and exceptional commercial ability. In the summer of 1901, Mr. Allan was appointed, out of 77 applicants, Manager and Secretary of the Scarborough Gas Company, in succession to Mr. John Holliday, who had obtained the position of Resident Engineer of the Sutton, Southcoates, and Drypool Gas Company; but before leaving Nelson the following October, he was entertained by the heads of the Corporation departments at a farewell dinner, and presented with a spirit-stand as a memento of their association with him. When he left Nelson it was acknowledged that the gas-works were on a better basis than they had ever been before; while during his management of them there had never been a dispute between him and the workmen.

Mr. Allan had not been long at Scarborough before he thought about improving the lighting of the town; and one of his latest achievements was the illumination of the Spa by means of high-pressure lamps, producing a very fine effect. Under his management the Company had a highly satisfactory record. About two years ago, as the result of their success—reductions in the price of gas having been made year by year during the previous five years—the Board decided that the workmen should participate in the prosperity which they had helped to produce; and Mr. Allan had the gratification of announcing this decision at a meeting of the men, who expressed their thanks to the Directors for their voluntary liberality, and for the interest they had always shown in the welfare of their workmen. So far as we are aware, the relations of the Board and their Manager and the employees were of the most cordial character. Early in 1912, Mr. Allan's son—Mr. Philip Allan, who for more than four years had been engaged with the North Middlesex Gas Company at their Mill Hill works—was appointed Assistant Manager and Secretary at Scarborough.

Mr. Allan was a member of the Institution of Gas Engineers, and also of the North of England Association, having joined the latter body in the autumn of 1902. At the meeting in Newcastle-on-Tyne in April, 1908, he read a paper entitled "A Few Practical Notes on High-Temperature Carbonization," in which he gave the results of his working with Klönne settings. The paper evoked congratulations from the author's colleagues, one of whom (Mr. C. Dru Drury) said he thought Scarborough might be considered to "hold the blue ribbon in the carbonizing field." In the course of some correspondence which took place in our columns early in 1903 on "Inclined *v.* Horizontal Retorts," Mr. Allan expressed the opinion that the time would come when the former system would be worked by electricity—not on the charging-floor, but from an office at the end of the retort-house; and in reply to a letter by Mr. John West suggesting that Mr. Allan had not treated the question with the seriousness it deserved, the latter said this was by no means the case. He thought electricity might be brought to play an important part in the economy of all retort-houses, and that Mr. West's own machines would some day be seen "fitted with, and worked by, electric motors."

Mr. Allan was a Freemason, and at the time of his death was Hon. Treasurer of the Ganton Golf Club, in which he took great interest. He was fifty-six years of age, and leaves a widow and one son, to whom reference has already been made.

The interment took place last Tuesday at the Scarborough Cemetery, after a service in Holy Trinity Church, the Vicar of which (Rev. C. W. A. Clarke) officiated. In addition to members of the family of the deceased, the chief mourners included the Chairman (Mr. W. S. Rowntree) and Directors of the Gas Company; and among those present at the church were Mr. W. M. Galleway, the Engineer and Secretary of the Whitby Gas Company, and several representatives of firms connected with the gas industry.

DEATH OF MR. S. S. MELLOR.

The death occurred at Northwich on Monday of last week of Mr. Samuel Slater Mellor, for thirty years Engineer and Manager of the Northwich (Cheshire) Gas Company. Mr. Mellor, who was in his fifty-eighth year, was a native of Rochdale, and prior to going to Northwich was Assistant-Manager at the Rochdale Gas-Works. He joined the Gas Institute in 1884, and passed into the present Institution, of which he was a member at the time of his death. He was for many years Secretary of the Manchester District Institution of Gas Engineers, but relinquished the position in 1901, when he was presented with ten guineas as a small recognition by the members of the work he had done. For nearly thirty years he was a member of the "Sincerity" Lodge of Freemasons at Northwich, of which he had been W.M., and for twelve years Secretary. He took a prominent part in the formation of the "Northern Star Lodge;" and was a Past Provincial Officer of East Lancashire and of Cheshire—being well known in masonic circles in both counties.

The funeral took place last Wednesday; the service being conducted in the Northwich Parish Church and at the Cemetery by the Vicar (Rev. H. Noel Nowell). The chief mourners were Mr. Eric Mellor (son), Messrs. William, James, John, Mathew, and Henry Mellor (brothers), Messrs. H. C. Yarwood and W. Clegg (sons-in-law), and Henry Gittens. The funeral was attended by Mr. C. T. Eachus and Mr. J. A. Woodall, representing the Directors of the Gas Company, Mr. J. G. Brentnall (Manager), and Mr. P. Welbourn (Secretary). The procession was headed by a number of the gas-works employees; and six of them were pall-bearers. The Masonic Lodges were represented—the "Northern Star" by Bros. S. Meunier, W.M. (Stockport), Jordan, S.W., W. Bro. Tim Duxbury, P.M., P.P.G.St. East Lancashire, and J. R. Lee (Oldham). The following representatives of the Manchester District Institution of Gas Engineers were also present: Messrs. G. S. Frith (Runcorn), Secretary, F. Sidwell (Winsford), J. E. Lamb (Altrincham), and T. Duxbury (Oldham). The President, Mr. J. G. Newbigging, was prevented from attending owing to an important engagement.

From Timekeeper to Manager.

A Lancashire correspondent writes: Mr. Mellor was the eldest son of the late Mr. Samuel Mellor, who was for many years in the Weights and Measures Department of the Lancashire County Constabulary, and was stationed at Middleton (where his eldest son was born) and afterwards at Rochdale. The family came to Rochdale when Mr. S. S. Mellor was quite a child. He started work in the mill; and afterwards went to the Rochdale Gas-Works as timekeeper and storekeeper—ultimately rising to the post of Assistant-Manager. In this position he served first under Mr. T. O. Paterson; then with his successor, Mr. William Romans; and for a brief period under the present Engineer, Mr. T. Banbury Ball, who came to Rochdale in 1881. It was in that year that Mr. Mellor secured the appointment of Manager at Northwich. His health had been failing for some time; but he was only confined to bed about a fortnight before the end. His wife died about three months ago, and he now leaves one son and five daughters. Four of his brothers are resident in Rochdale, one of whom is an assistant at the Dane Street works.

OBITUARY.

Mr. George Webb, J.P., who died recently at his residence in Bury, in his 71st year, was actively interested in a large number of gas undertakings. He was Vice-Chairman of the St. Anne's-on-Sea Gas Company, and a Director of the Radcliffe and Pilkington Gas Company.

Mr. G. B. A. Gibbons, the Joint Managing Director of the firm of "B. Gibbons, Junr., Limited," and the Assistant Managing Director of the firm of "Gibbons Bros., Limited," died at Sion House, Clent, near Stourbridge, on the 8th inst. The deceased gentleman served his apprenticeship under Mr. Charles Hunt at the Windsor Street works of the Corporation of Birmingham for two years, and was afterwards General Assistant for three years. In 1888, he was appointed Manager of the Eccles Street Gas-Works of the Liverpool United Gaslight Company, under Mr. William King, the Engineer. In 1893, he joined the Dudley firms mentioned above; and the notable success of these businesses is said to have been largely due to his personal and general engineering knowledge.

The death took place, suddenly, at his residence at Nottingham last Thursday night, of Alderman John Jelley, who had long played a prominent part in municipal affairs, manifesting especial interest in relation to the water and gas undertakings of the

Corporation. He was for several years Chairman of the Water Committee, and with Sir Edward Fraser represented Nottingham on the Derwent Valley Joint Board. In the agitation which arose some years ago in reference to matters connected with the administration of the gas undertaking, deceased sustained a leading share in the criticism of certain alleged existing conditions. He was one of the few witnesses to give evidence before the Special Committee of Inquiry presided over by Sir John Turney, when he adopted a very strong view, in which he was supported by a former Chairman of the Gas Committee. The late Alderman, who served the office of Sheriff of the City in 1887, had been a member of the Council for twenty-eight years.

It is with much regret that we have received from the Société Technique du Gaz en France the announcement of the death of M. GEORGES VISINET. He was a Past-President of the Société Technique, having been a member since the year 1881, and having been elected President in 1905. M. Visinet continued to occupy the presidential chair the following year. Those who were present at the French Society's meetings during those two years will well remember the amiable disposition, and the genial control of the proceedings which the President showed. He was popular alike for his kindly friendliness, his humour, and his artistic feeling. These admirable characteristics were particularly marked on the occasion of his visits to England, as during the Earl's Court Gas Exhibition and on other occasions. M. Visinet was the Manager of the Compagnie du Gaz de Saint-Germain-on-Laye, near Paris, and was also connected with the Compagnie du Gaz Central (Lebon and Cie.). The funeral took place yesterday at the cemetery of Père-Lachaise.

HIGH-PRESSURE SYSTEMS.

IN the "JOURNAL" for March 31 and the week following, lists of cities and towns were published where there are high-pressure systems in use. A correspondent sends the following supplementary list of towns to which gas-compressors have been supplied; but whether for boosting, for distributing purposes, or for private high-pressure installations, or for street lighting and shops supply, we have no information:—

Airdrie	Hemsworth	Runcorn
Annfield Plain	Hull	Risca
Barnard Castle	Kelty	Stourbridge
Blackrod	Kirkby Stephen	Smyrna (Ottoman Gas Company)
Broadstairs	Lea Bridge	Warwick
Clay Cross	Mablethorpe	Wellington, N.Z.
Crowborough	Newtownards	Westgate-on-Sea
Chesterfield	Nelson	
Draycott	Pudsey	
Farnworth	Romford	

British Commercial Gas Association.

The Association have arranged a Wales and Monmouthshire District Conference, to be held on Thursday afternoon of this week, at the Great Central Hall, Newport, under the presidency of Mr. H. Melvill Brewer, J.P., the Chairman of the Newport Gas Company. A reception of members and visitors by the Mayor of Newport (Dr. J. Lloyd Davies, J.P.) and the Chairman and Directors of the Gas Company, will be followed by an address of welcome by Mr. Melvill Brewer and an address by Alderman Thomas Canning, J.P. (the Chairman of the Conference). Two papers will then be read and discussed—"An Opening for the Expansion of Business," by Mr. George Clarry, F.C.I.S., of Cardiff; and "Gas Development in a Mining Area," by Mr. Arnold W. Branson, of Caerphilly. In the evening Professor Vivian B. Lewes will lecture on the "Hygienic Value of Coal Gas as an Illuminant and a Fuel;" and there will be a reception to meet the Chairman and Directors of the Gas Company. Then, on Monday of next week, there is to be a conference at Redhill. The conference, which will be under the presidency of Mr. W. Lees Stenning, J.P. (the Vice-Chairman of the Redhill Gas Company), will take place in the Market Hall. The members and visitors will be received by the Mayor of Reigate (Mr. G. A. R. Ince, J.P., C.C.) and the Chairman and Directors of the Gas Company. Mr. Stenning will deliver an address of welcome; and there will also be an address by Mr. W. J. Sandeman, the Chairman of the Conference Committee. Thereafter, a paper on "Business Building" will be read by Mr. R. W. Edwards, of Aldershot, and discussed. A lecture by Professor Lewes in the evening will be followed by a reception to meet the Chairman (Mr. G. R. Hunt, C.C.) and Directors of the Redhill Gas Company.

There were 33 applications for the position of Gas and Electrical Engineer to the Malvern Urban District Council, rendered vacant by the removal of Mr. W. H. Johns to West Bromwich. These have been reduced to a short list of three candidates, who will be interviewed to-day.

Next Saturday the annual general meeting of the Scottish Junior Gas Association (Eastern District) will take place. The report and balance-sheet will be submitted, officers elected, and alterations in the rules discussed. There will also be a paper read by Mr. C. Hamilton (of Loanhead) on "Developing Sales of Small Works."

ELECTRICITY SUPPLY MEMORANDA.

THE "Electrical Times" has recently been publishing suggestions for "copy" for advertisements for use by electrical undertakings, in several of which suggestions there have appeared oblique or direct assertions regarding the quality of gas, and the effects of its combustion, which are intended to, on false grounds, disparage it in the eyes of local householders, and so cause damage to undertakings the businesses of which are being conducted under conditions as to purity and otherwise statutorily laid down for the observance of the managements. Among the suggestions for "copy" has been a reference to the "Lancet" article on the subject of sulphur in gas, and its, within the limits of content, supposed detrimental effects, upon which latter we joined issue with the "Lancet," and our medical contemporary has not been able to refute our contentions on chemical or any other grounds. The "Electrical Times" is aware of this; nevertheless its notions of fair play are not of an order that restrains it from giving the go-by to our destructive criticisms of the "Lancet" article, and from quoting from it as though it had never been impeached, and the impeachment had not been set aside. Every right-minded man knows the proper description to apply to such conduct. However, the point that our criticism has not been answered is one that electrical managers who desire to make use of the "Lancet" and "London gas" for the purpose of indirectly disparaging gas in any locality, for the obvious purpose of taking custom from the local gas undertaking, and in this way doing it damage, should not overlook. The point may be of importance in the discussion of questions of fact, if need demands. Now, according to the "Electrical Times," Mr. —— has received a letter from a gas company threatening him and his company with an action for libel for publishing and circularizing the statement which we will quote in the next paragraph, and our contemporary "seems" to think the threat was practically a "try on." With this we are not concerned, as we do not know the company to which allusion is made, nor whether all the circumstances are present that would enable the successful prosecution of an action. But this we do know, there are various gas administrations who are prepared, acting under high legal advice, to go to the fullest lengths with a case—even, if necessary, to the House of Lords—if they can get evidence of damage having followed the publication of false and therefore defamatory statement. The "Electrical Times" has sought an opinion from Counsel to ascertain his views whether the cowardly method of indirect trade defamation is legal, under a set of specifically stated circumstances; and it has received the affirmative opinion that it ardently desired.

The Legality of Cowardly Defamation.

The Statement.

The advertisement in question arises out of the "Lancet" article; it was published and circularized in (we take it) a district away from London; and the inclusion of the words "London gas" in it is considered by the learned Counsel concerned as sufficient protection of the electricity people who caused, and are responsible for, its publication in the locality. "If," he states, "'London gas' had been omitted, so as to suggest false facts, then damages or an injunction could be obtained." That is an admission of a very thin protection—of, in the circumstances as stated, an extremely narrow border-line between legal slander and that which is not legal slander. The circularized statement is as follows:

> At one time there was a parliamentary restriction in regard to the amount of sulphur in gas; the gas companies being required to keep the total sulphur in the gas distributed down to about 20 grains per 100 cubic feet. As a matter of fact, under this requirement the companies kept the amount down to 12 grains. In 1906, however, the restriction ceased owing to the increased economical usage of gas; and then the gas supplied frequently contained 48 grains of sulphur per 100 cubic feet. The companies saved money, of course, because the removal of this restriction meant that they could do without a purification process, which was expensive or troublesome to carry out. The gas supplied, however, proved so detrimental to the metal work of burners and fittings, that to save their own reputation a method of partial purification was again brought into requisition. At the present time, however, London gas contains still an amount of sulphur which cannot be overlooked in view of hygienic, artistic, and economical considerations. It averages above 24½ grains per 100 cubic feet.

Let us consider the circumstances of the publication, and the statement itself. First of all, what was the intention of publication by an electricity undertaking in a local paper—to defame or otherwise the prime commodity of the local gas undertaking? There is only one answer. Whether the defamation is actionable or otherwise depends upon the "facts," and whether damage ensues. Counsel consulted by the "Electrical Times" recognizes this, by quoting from Dr. Blake Odgers' "Law of Libel and Slander:" "If a man, after lauding his own goods, and expressing his opinion that they are superior to the goods manufactured by others goes on to make assertions of fact about his rivals' goods, *which he cannot prove to be true*, such disparagement will give rise to an action on the case, *provided the words be published without just cause or occasion*, and *special damage* ensues." Now it will be observed that only the last four lines of the advertisement in question

specifically mentions "London gas." As the statement stands (assuming that was how it was published) all that precedes has general application; and therefore, being published by an electricity concern in a given locality, would apply, considering the obvious intention of publication, to the local gas undertaking. Examine the first few lines:

> At one time there was a parliamentary restriction in regard to the amount of sulphur in gas; the gas companies being required to keep the total sulphur in the gas distributed down to 20 grains per 100 cubic feet. As a matter of fact, under this requirement, the companies kept the amount down to 12 grains. In 1906, however, the restriction ceased, owing to the increased economical usage of gas——

Does that apply to the local gas company? If not, why was it published in that company's district? The published and circularized statement does not say what Counsel himself is careful to point out, that the local "company's Special Act prescribes the 20 grains maximum referred to." It is therefore not a "fact" that the "restriction" ceased so far as that particular company are concerned. Whatever were the restrictions existing in the case of any company prior to 1906, they still exist except in cases where Parliament has specifically annulled the restriction. Then is it a "fact," or is it not, that the local company's gas has "frequently contained 48 grains of sulphur per 100 cubic feet of gas?" If the Special Act prescribes 20 grains, we may say that the insinuation is false as to it having frequently contained 48 grains. Let us suggest, too, that the appearance of the comma after the word "process" makes a good deal of difference to a question of fact respecting gas purification. Then with regard to what follows, is it not the intention of the local circulators of this defamatory statement that the local consumers of gas should be misled into believing that the local gas contains something that is detrimental from "hygienic, artistic, and economical" points of view? It would be quite easy to prove, as those who read our reply to the "Lancet" article are aware, that any detrimental hygienic effect is a myth; whether gas is artistic and economical depends on the mode of use and personal fancy. We are perfectly convinced by the reference in the opinion of Counsel to the inclusion of the words "London gas" that he recognizes that those who published the statement were skating on very thin ice; and, the recognition of this would be intensified, if Counsel fully appreciated all that the lines mean preceding the four containing the words "London gas."

Disparagement and Malice.

Seeing the circumstances under which the statement was published, it is clear that the intention of its publication was to disparage the commodity of the local gas suppliers. It can also be proved that the intended disparagement is based on facts that are not true as applied to the local gas supply. The most difficult thing to prove is actual damage. This can only be done by ascertaining whether the publication of any false statement has had direct influence in inducing people to divert their patronage from gas to electricity. There are gas undertakings that would be glad to obtain evidence of damage, and actions would result that, as already intimated, would not be dropped if necessary until the law had said its last word. This would mean to one side or the other something more than the payment of a "few guineas" to a "local solicitor." The point of "malice" is not so difficult to prove; for it is manifest that the local electricity suppliers deliberately went out of their way to publish and circulate matter which has no application to the local gas supply with the sole intent to disparage it, and to prejudice lay minds against it. Mr. Spencer Bower, K.C., in his "Code of the Law of Defamation" defines "disparagement" and "malice" in the following terms: "Disparagement means and includes any publication of matter, the meaning or effect of which is to deny or cast doubt upon the existence or validity of any person's right, claim, title, or interest to, or in, any property, or *to depreciate or disparage the merits, utility, qualities, or value of any person's property*; but the mere assertion by any person that any manufacture or invention of his own or any class of goods in which he deals, or other like property, is superior to that of all other persons, or of any particular person, does not of itself constitute the disparagement." "Malice means *any motive other than* that of asserting, protecting, promoting, or defending any claim, interest, or duty, either of the person who has published the disparaging matter, or of some person whom in virtue of privity of estate or agency he is entitled to represent, or to, or in, or with reference to the property disparaged in the existence and validity of which claim he believed when publishing the matter."

Refuge Behind Insinuation.

It is not such a simple matter this game that the "Electrical Times" has been urging electricity undertakings to play as is represented by any opinion of a single Counsel; and those responsible for the conduct of such undertakings should not be misled by the misinformed on technical matters affecting gas and the ill-considered contemptuous words of writers who are careful enough not to give their ignorance and words special application to the commodity of any particular concern—leaving that for the electricity suppliers to do. Electricity supply managers must know that in most cases the opinions of learned Counsel predict success for both parties to a suit, but only one party succeeds. The most pitiful part of the opinion published by the "Electrical Times" is the straightforward confession on the part of Counsel that this paragraph published and circulated locally in order to disparage the local gas supply would have been actionable if the words "London gas" had been omitted. Our own views on this point in regard to the main part of the paragraph have already been expressed. The meanness and cowardice of taking refuge behind these words are, under the circumstances, palpable to every honest man. We should like to have an electrical man responsible for such meanness and cowardice in the witness-box, and cross-examine him as to his motives in publishing matter of the kind. As we have before stated, there are gas undertakings that have also taken Counsels' opinion on this particular subject, and now only require—this despite the opinion of the Counsel consulted by the "Electrical Times"—the proof of damage to complete cases that we are confident would have a very salutary effect upon those in the electrical industry who have cowardly recourse to innuendo in their advertisements. Perhaps those responsible for the conduct of an electrical undertaking who have been guilty of this mean form of procedure to which we have referred will give the necessary information as to persons who have been persuaded by defamatory advertisements to change their patronage from gas to electricity. Then they might at the same time secure the services of some of their journalistic advisers to give evidence for them, so that they may be put under cross-examination. We could promise them at least a little fun for their money. The law was not made to put a white sheet round subterfuge, false pretence, and ignorance in commercial affairs.

How a Silly Error was Emphasized.

We will keep to matters this week that have appeared in the "Electrical Times," The writer of "Cooking and Heating Notes" has again been harping upon the subject of cooker efficiencies, and in a manner that shows he knows little about it. In fact he makes such a ludicrous blunder, as well as an error in argument, that the electricians who have read his criticism must have had a very hearty laugh at his expense. Of course, the gas-cooker is doomed by the article to be supplanted by the electric-cooker. When or how is not stated. But the writer has every confidence in his statement, though he cannot find any substantial support for his belief, after carefully exploring the vastness of electrical creation to find it. He acknowledges that the gas-cooker is the backbone of the cooking branch of the gas industry's business [we believe he is correct], and that there is nothing much in the electrical line that will meet the requirements of the householder who cooks lavishly on Sunday, and contents the family with small things—as chops and steaks—for the rest of the week. Nevertheless, the gas-cooker is doomed. In his own mind, satisfactorily disposing of this matter, he attacks a statement attributed to Mr. F. W. Goodenough, that he has had two legs of lamb cooked, both weighing 76 oz.—one in an electric oven, the other in a gas-oven. The loss of weight of the electrically cooked joint was 11·2 per cent., and of that in the gas-oven 9·3 per cent. We assume that they were both cooked equally. He does not say that Mr. Goodenough is guilty of falsehood; and he does not offer to prove in Mr. Goodenough's presence that he deserves to be branded with a four-lettered word that does not sound well in polite society, nor looks well in print. But he casts doubt on the assertion. He sneers at the efficiency of the little gas-griller at the top of the ordinary gas-oven; and apparently thinks this is sufficient for electrical readers to dispose of the efficiencies and costs in operation of all other parts of the gas-cooking equipment. This is an error in argument; but the ludicrous arithmetical mistake, and the question prompted by it, is the masterpiece of the whole wordy bombardment. The costs of cooking the 76-oz. joint with electricity at 1d. per unit was 2d.; with gas at 2s. 6d. per 1000 cubic feet, 0·42d. The last figure, the writer says, "represents *only* 75 cubic feet for cooking 76 oz. of meat—1 foot per oz. of meat!" The "1 foot per oz." is an expression of honest astonishment at its smallness, which shows how deep is the knowledge of his subject of the writer of "Cooking and Heating Notes." That he fully believes he has a good case is shown by the added inquiry: "Has anyone but the Commercial Gas Association been able to get so much out of 75 cubic feet of gas?" We earnestly hope so. In fact, if people had not been able to do more with 37,500 B.Th.U. than cook a 76-oz. joint of meat, gas cooking would have been dead long ago. If the writer will calmly try to make a calculation, he will find that 0·42d. spent on gas at 2s. 6d. per 1000 cubic feet will only buy 13·86 cubic feet. If he was so frightfully astonished over the 75 cubic feet of gas, he will require someone to restrain him when it dawns upon his mental appreciation that he gave 0·42d. a buying power 61·14 cubic feet too great. We should advise him to look at the table on p. 643 of the "JOURNAL" for March 10, and multiply by the cubical capacity of the oven the cubic feet of gas required per cubic foot of oven space to obtain and maintain a temperature of 360° Fahr. in gas-ovens old and new, and some of them not of the best. It is very stupid to magnify one's ignorance as this particular writer has unconsciously done.

Without Interest.

The simplicity and small cost of gas-heated appliances, and the complication and expensiveness of the construction of electrically-heated appliances, cause the purchase of the latter to look a very serious business in the eyes of householders. Consequently, the appliances are slow of adoption. The Marylebone Electricity Department are now trying to boom-up things in this

direction by offering to send to electricity consumers, without initial payment, and without interest, a 4 lb. or 6 lb. electric-iron, a 2 or 3 pint copper electric-kettle, or an electric-toaster. Five shillings per quarter is to be added to the electricity accounts until the cost is liquidated. The iron is guaranteed for three years; and the kettle and toaster for twelve months. This may "take on" with some people in Marylebone; but not largely in most other places. But if the electricity users in Marylebone desired to try these things, we should have thought that, generally speaking, they could afford to buy them outright, and not have anything to do with the easy-purchase system.

NOTES FROM ABROAD.

Canadian Gas Association.

At a meeting of the Executive of this Association recently held in Ottawa, it was decided that the annual convention should this year take place in Ottawa on June 11 and 12. At the same time some of the preliminary details were settled.

A New Tamping Machine.

A New York firm, the Wemlinger Company, has put on the market a new machine for filling up trenches after main-laying operations. The Consolidated Gas Company, of New York, states that with this Staley Power tamping machine back-filling of trenches can be accomplished at a cost of only 8 c. (4d.) per yard, using up every bit of earth excavated.

Tax on Gasholders.

It has lately been decided, at the Japanese taxation offices, that a tax is to be imposed on gasholders. Up to the present they had been regarded as a kind of machine, and so were not liable to pay any taxes. The authorities, however, after an inquiry into the matter, have decided that a gasholder is a building, and not a machine. The rate fixed is 0·009 of the rental value, which is reckoned at 10 per cent. of the total value of the holder.

Meter Deposits in New York.

The companies supplying gas to New York city are said to hold deposits on meters to the value of $3,557,173 (over £741,000)—this not including accumulated interest, which is at the rate of 6 per cent. per annum, and is generally not paid until the consumer gives up his meter or changes his residence. The authorities of the city have ordered an inquiry to be made into the whole question of these deposits and the manner of dealing with them; there having been complaints in several instances of the difficulty of recovering them from the companies.

Town Supplied with Gas by Motor.

A recent number of "Prometheus" contains an account of the manner in which Aarburg is supplied with gas from the neighbouring town of Olten (Switzerland). A heavy 60-H.P. motor lorry is loaded with nine tanks, which contain ordinary town's gas, compressed to 30 atmospheres. Arrived at their destination, the tanks are unloaded by means of a crane, and the gas passed into the holder. It remains to be seen how the cost of transport will work out. Should this prove reasonable, there seems to be here a new method of giving a gas supply at low capital cost to small communities, which would otherwise be beyond their reach.

National Gas Advertising in U.S.A.

The National Commercial Gas Association of America has now decided to commence a scheme of national advertising, such as is carried on by the B.C.G.A. in England; the funds being considered to have reached a point which justifies the new departure. Besides the publication of advertisements in national newspapers and periodicals of wide circulation, it is proposed to send to each subscribing undertaking copy for three different advertisements each week, for insertion in local papers, with special instructions as to type and setting arrangements. Thus each undertaking will receive in return for its subscription, besides the general work done by the Association, the help of the advertising experts employed.

Increased Competition in Fertilizers.

The continued growth of the synthetic ammonia industry is shown in a remarkable way by the results for the last year of the two great German firms which exploit it. The Badische Anilin- und Sodafabrik, of Ludwigshafen, and the Farbenfabrik, vorm. Friedrich Bayer and Co., of Leverkusen, each paid a dividend of 28 per cent. on the year, and both are increasing their capital—from 36 million to 50 million marks, and from 36 million to 54 million marks, respectively. The main object of these capital increases is to exploit the Haber process for the production of synthetic ammonia, and the result will no doubt be increased competition in the fertilizer market.

Tokyo Gas Undertaking.

Some details of this undertaking from the "Journal of the Imperial Gas Association of Japan" are interesting. The report for the last half of 1913 shows a consumption of 1558 million cubic feet—an increase of nearly 7 per cent. over the corresponding period of 1912. The gas was sold at a reduced price, and the sliding scale system adopted for the first time. In view of this, the consumption was not considered entirely satisfactory, though the suburbs showed an increase of over 22 per cent. However, a dividend of 9 per cent. was declared, which should not give rise to dissatisfaction. The largest portion of the gas consumed is still used for lighting; only about 40 per cent. being devoted to heating purposes, and about 13 per cent. to industrial motive power. It is in this latter direction that progress is hoped for, since electricity, which claims most of the users of power, is very expensive in Japan.

An Order to Equalize Gas-Rates.

The Railroad Commission of California have issued an order in which they find that the Western States Gas and Electric Company have been discriminating among their patrons in the vicinity of Lodi, San Joaquin county—affording to some rates lower than those on file with the Commission. In their order the Commission direct that the Company shall cease their discrimination, and put into effect a new rate for agricultural service. The Commission state further that if this new rate is not as low as the lowest rate now being allowed to those patrons in whose favour there has been discrimination, the Commission will institute an investigation into all the rates, regulations, and practices of the Company; and the investigation will also include consideration of the "conduct of the Company in departing from legally established rates and schedule."

Compression of Natural Gas.

Mr. Leland, the Manager of the gas-compressing station at Pittsburg, has furnished, in a paper presented to the West Pennsylvania Society, the following particulars in regard to the compression of natural gas. Originally, the pressure of this gas in the earth, in pounds per square inch, was: Pennsylvania, 823; Ohio, 454; Indiana, 326; West Virginia, 1000; and Kansas, 397. These pressures have fallen off to such an extent, that in some places they are now below that of the atmosphere. In order to send the gas to great distances in pipes of reasonable size, it has been necessary to resort to compression, not only at the starting-point, but sometimes at intermediate stations. For example, a pipe-line 96 miles long and 16 inches in diameter, conveying gas at an initial pressure of 100 lbs. and a final pressure of 10 lbs. per square inch, would deliver about 12½ million cubic feet of gas per 24 hours; whereas, if the initial pressure were raised to 350 lbs., the output would be about 41 millions. An attempt was made to aspirate the gas to the point of discharge from the main; but it was unsuccessful, and compression had consequently to be relied upon.

Increased Gas Consumption in Amsterdam.

According to the report on the working of the municipal gas undertaking in Amsterdam for the year ended Dec. 31, 1912 (the last issued), while the increase in gas consumption in 1911 was only 1·47 per cent., this was exceeded in the first six months of 1912 (1·91 per cent.), and in the second it rose to 5·49 per cent.—giving an average of 3·7 per cent. for the year. This represents an increased sale of gas to the extent of about 118½ million cubic feet; and the upward movement was steadily going on early last year. Contracts have been entered into for the supply of gas to three neighbouring communes, in two of which the gas will be sent direct to the consumers from the works at Amsterdam, while in the other it will be delivered into a holder on the spot. The net profits per 1000 cubic metres (35,300 cubic feet) of gas sold in the year covered by the report amounted to £2, of which about half went into the municipal exchequer and the rest was placed to reserve. This is the largest profit realized during the fourteen years that the gas undertaking has been in the hands of the Municipality.

Testing for Carbon Monoxide.

In the last number of the "Journal de l'Eclairage au Gaz," M. Grebel directed attention to a communication by M. Busine in the "Bulletin," of the Belgian Gas Association, on the subject of the methods employed for testing appliances for heating and cooking by gas, in which the author gave particulars of the processes employed by hygienists for ascertaining the presence of slight traces of carbon monoxide. In analyses made with gas burettes, something approaching 0·5 per cent. is allowed; but M. Grebel says that, from the point of view of toxicity, 1-10,000th of the impurity should be detectable. The processes now in use may be divided into three classes. The first is based upon the reducing properties of carbon monoxide—upon iodic acid for example; the iodine being disclosed by the colorimetric method with the Levy and Pécoul apparatus. The second process is based upon the affinity of carbon monoxide for the hæmoglobin of the blood, and the stability of the carboxy hæmoglobin thus formed. Spectroscopic examination of the solution of the defibrinated blood allows of the certain disclosure of the carbon monoxide. In the third class, M. Busine places the Guasco toximeter, which is based on the liberation of heat due to the absorption of gases by platina. But M. Grebel points out that the apparatus is sensitive to other gases than carbon monoxide; and he says it is to be wished that an apparatus could be constructed of greater precision than that possessed by gas burettes, yet not having the high degree of sensitiveness of the instruments used by toxicologists.

North of England Gas Managers' Association.—The half-yearly meeting of the Association will be held in Tilley's Rooms, Market Street, Newcastle-on-Tyne, on Saturday of next week, May 2. Mr. E. F. Hooper will preside; and, in addition to the formal business, Professor J. W. Cobb, B.Sc., F.I.C., will lecture on "A Problem of Modern Gas Practice. Luncheon will follow the meeting.

PRESENTATIONS TO MR. P. C. HOLMES HUNT.

Mr. J. N. Reeson, who left England at the end of January to take up the position of Chief Engineer to the Metropolitan Gas Company of Melbourne, reached that city on March 9, after a very pleasant voyage, and took up his duties a few days afterwards.

Mr. P. C. Holmes Hunt, on the occasion of his relinquishing the position which Mr. Reeson has thus taken up, was the recipient of some very gratifying tokens of appreciation and goodwill. The first of these presentations—taking them in the order in which they were made—was an exceedingly handsome roll-top desk (with a suitable inscription engraved on a silver plate), given by the chief officials, for whom Mr. Hinde was the spokesman, and made the presentation. The next took place at a complimentary dinner which was given to Mr. Hunt by the engineering staff, and at which nine or ten of the officers spoke to the toast of his health. At the conclusion of these speeches, he was presented with a magnificent illuminated address bound in morocco, and placed in a polished blackwood case. The address, of which Mr. Hunt is justifiably proud, is a really artistic production, and is in the following terms:

To P. C. Holmes Hunt, Esq., M.Inst.C.E., F.I.C.

Sir,—We, members of the Engineering Staff of the Metropolitan Gas Company, Melbourne, keenly regret the severance of your connection with the Company occasioned by your relinquishing the position of Chief Engineer—a position so ably filled by you during the past eight years.

We take this opportunity to gratefully acknowledge the kindly tact and courteous consideration which have invariably characterized your attitude towards us. Your high technical knowledge and engineering skill have won our respect and admiration; and we wish to express appreciation for the distinct advantage we have gained by our association with you. To your initiative, organizing powers, and untiring zeal in the interests of the Company, and also the *esprit de corps* fostered by you in the staff, are attributable the successful outcome of the various works undertaken by you during your tenure of office.

It was due to your masterly conception of the improving gas engineering methods that the City of Melbourne has the proud distinction to-day of being amongst the foremost cities of the world which lead in modern scientific coal carbonization. Under your *régime*, the first vertical retort installation in the Southern Hemisphere was successfully put into operation in July, 1912, at the South Melbourne Works of the Company.

We desire to congratulate you on your joining the Directorates of the various important Australasian Companies to which you have lately been appointed, and are confident that your future, in which we shall always be interested, will be one of great distinction.

Trusting that you will be blessed with the necessary health, and that you may be spared to a long life of usefulness to the community, with benefit to yourself, we beg to subscribe ourselves,

Yours very sincerely,

[Twenty-one signatures follow.]

On the last day of Mr. Hunt's official connection with the Company, the Chairman (Mr. John Grice) and Directors entertained him and the chief officers at dinner, and presented him, on behalf of the Company, with a beautiful tea and coffee service, complete with a large tray, richly chased, and appropriately inscribed. This was accompanied by a cheque. The gathering was a great success; and it is hardly necessary to add that Mr. Hunt and the Company, and all concerned, have parted the best of friends.

Errors in Gas Analysis.

In the course of various investigations, the officials of the United States Bureau of Mines have sampled and analyzed the gases found in coal and metal mines, those which flow from wells in oil and gas fields, and those produced during the process of combustion in furnaces. A Technical Paper [No. 54] has lately been issued giving the results obtained by Messrs. G. A. Burrell and Frank M. Seibert of investigations carried out by them with the view of ascertaining the errors in gas analysis due to assuming that the molecular volumes of all gases are alike. In determining the purity of certain combustible gases by the method of slow combustion, the authors found that in some analyses the volume of carbon dioxide and the contraction produced by the combustion did not agree with the theoretical value, according to the equations ordinarily used for showing the reaction. Also, in analyzing some natural gases by the same method, the paraffin hydrocarbons present totalled over 100 per cent. The differences were greatest when the oxygen taken was only a few cubic centimetres in excess of that required to burn the gas completely. The variations could not be attributed to experimental errors, because all the analyses were carefully performed in duplicate, and the gas burettes were accurately calibrated. Consequently, an inquiry was made to determine the errors that might arise in the combustion method of analysis, by assuming that the molecular volume (the quotient of the molecular weight divided by the density) is the same for every gas. The paper presents the results of the inquiry.

We have received from the Secretary (Mr. A. L. Griffith) a copy of the rules and list of members of the Society of British Gas Industries. On the front pages there are given the names of the officers for 1914, of the Past-Presidents, and of the Central Council.

GAS EXHIBITS AT OLYMPIA.

To the innumerable shows to which it has given a home, Olympia has now added a Children's Welfare Exhibition, which has been promoted by the "Daily News and Leader," and will remain open until the end of the present month. Interpreted in its broadest—and its proper—sense, "children's welfare" embraces a very wide range of subjects; and this is just what it does at Olympia. On the stands themselves there are all kinds of things, from sweets and toys upwards—or downwards, according to the views of the visitor. In addition, there is a children's playhouse, with two performances daily; a "Cornish Riviera" in the annexe, with a pier, real sand and live donkeys, and a miniature railway; a "Woman's Kingdom;" and various lectures and entertainments. Viewed as a whole, there is plenty to take the attention of old and young. In fact, it strikes one as possible that the great number and diversity of the "attractions" may divert from the exhibition proper some amount of attention which it would otherwise receive. But then, if it were not for the special attractions, perhaps there would be fewer people at Olympia to have their attention diverted from the exhibits. So it is fair to conclude that the organizers have done their best for all concerned.

It has been said that there are many different exhibits; and these appropriately enough include gas. First of all, among the advertisements appearing in the official catalogue are two pages of eminently readable matter by Mrs. Cloudesley Brereton, who discourses on the "Nursery Bath and Hot-Water Supply" and "Dispensing with the Under Nurse." These are topics of close concern to the child, the mother, and—the under nurse. Indeed, an even wider circle of readers may safely be predicted for a paragraph headed "Divorce an Essential to Household Peace." But the divorce referred to is only of the cooker from the water-heater; the point it is here wished to drive home being that the separation of these two domestic appliances is the proper thing, whether or not any solid fuel is used.

Coming to the stands themselves, the principal display made by gas is in connection with a United Gas Companies' Exhibit. This occupies a large amount of space in a prominent position in the hall; and it is so arranged as to show a very large number of appliances without any appearance of crowding. The four blocks in the centre are each fitted with four fires, all connected-up and put in action in turns. They are the latest designs of leading makers—including Wilsons and Mathiesons' "Carlton Sola," and Fletcher, Russell, and Co.'s "Grosvenor" fire for adapting to existing barless grates. The object of the latter is to provide a fire approximate in appearance to a coal-fire, without entailing structural alteration to the grate. A covering of cinder fuel is provided on the top. There is also shown the Hands "Vitreosil" fire. Water heating is strongly represented by, among others, Wright's "B.T.U." circulator, fitted with pull-out burner and thermostat, Davis's "Gilled" circulator, Potterton's boiler, and "Maughan" geysers. There are also radiators, and a good selection of cookers—including Wilson's "Advance," the Cannon Iron Foundries' "County," and Wright's "School Board." In the last-named, the hot-plate and oven are placed side by side on a stand; the cooker being intended primarily for demonstration purposes, for which it is extensively used. Thwaites' warmers for muffs, beds, and motor-cars consist of a metal plate, which, after being heated over a gas-ring, is tightly enclosed in an outer casing, and retains its heat for a long time. A convenient piece of furniture for offices, and similar places, is the "Polyput" table. On raising the top, a metal-lined space inside is revealed, which holds a gas-ring for boiling a kettle, &c. Underneath there is a cupboard in which utensils may be kept. Another useful domestic appliance is the "Humphrey" gas-iron. For lighting the stand, there are "Nico" medium burners, with a handsome selection of fittings, and operated by "Pneumatic" switches.

Other stands in which "Journal" readers will be specially interested are those of the Harris Gas-Stove Company and the "Ellwhite" Gas-Stove Company (whose cooker was described a few weeks ago in our pages). Lighting by petrol vapour is also represented.

CONCILIATION IN TRADE DISPUTES.

A report is presented annually by the Board of Trade of their proceedings under the Conciliation Act of 1896. This is an Act which has for its object to provide for the registration of such boards as are constituted for the purpose of settling disputes between employers and workmen, and for the furnishing by them to the Board of Trade of such returns, reports of proceedings, or other documents, as may be required. Where a difference exists or is anticipated, the Board may take steps to secure an amicable settlement. They may upon the application of either party appoint a conciliator or a board of conciliation, or on the application of both parties nominate an arbitrator. There was published a few days since the eleventh report of the Board of Trade under the Act—dealing with the year 1913; and this, in addition to detailing the general proceedings, includes an appendix giving some particulars of settlements arrived at under the Coal Mines (Minimum Wage) Act of 1912. It bears the signature of Sir George Askwith, the Chief Industrial Commissioner.

The number of cases (99) dealt with in 1913 constitutes a record.

In the previous year there were 73 cases; and in 1911 (which was at that time the highest year) the number was 92. These figures do not include the appointments made in connection with the revised railway conciliation scheme. Of cases dealt with in the period covered by the report, 53 were disputes involving some stoppage of work. Since 1896, 696 cases have been dealt with; and of these there were applications from both parties in 417, or about 60 per cent. There were many instances in which application for the appointment of an arbitrator or conciliator was made by the parties as the result of negotiations conducted by officers of the department. Sometimes action has been taken at the request of third parties—for example, the mayor of the town in which the dispute occurred.

Much conciliation work is, of course, carried on apart from the efforts of the department; and, as a matter of fact, there were in existence at the end of 1913, so far as the officials were aware, 325 voluntary conciliation boards and standing joint committees. Of these, 310 were boards dealing with particular trades, and 15 district and general boards—including both those registered under the Conciliation Act and those not so registered. The rules of a number of these conciliation boards, and also other agreements arranged between employers and workpeople in various trades, contain a clause providing that, in the event of failure of the parties to effect a settlement of a dispute, application shall be made to the Board of Trade for the appointment of an arbitrator or umpire. There are, as a matter of fact, 121 cases in which clauses to this effect exist.

Among the cases in which action was taken last year, was a joint application for an arbitrator to deal with a claim by the gas-producer men at a works in Sheffield, for an increase of wages. It was held that no case had been made out for an advance of the wages of the leading gasmen; but there was a revision of the base-rate of the gasmen and cellar men. Similarly there was a joint application in connection with a dispute in which the steel makers in the West of Scotland and their men were involved. The point was as to the interpretation of an agreement regarding wages; and a court of arbitration gave a decision on the matter. At the time of the general strike of engineers at Southampton, the Chief Industrial Commissioner invited representatives of the parties to meet him. The employers assented; but the men refused. Having originally demanded an increase of wages of 3s. per week, the men ultimately accepted the masters' offer of 1s. 6d. A dispute which Sir George Askwith was mainly instrumental in adjusting was that in which the tube and other metal workers of South Staffordshire and North Worcester were engaged. This affected 50,000 workpeople in the metal trades; the demands involving a claim for a minimum wage of 23s. per week for labourers in the area covered by the dispute. Conferences took place, as the result of which an agreement was signed which provided for a standard rate of 23s. per week for the Birmingham district, with 22s. per week for the Black Country during six months from the date of the resumption of work, and thereafter 23s. Another dispute settled was that of the fire-brick makers of Stourbridge, who had a strike of about 1200 workpeople. A revision was made in the rates of pay in certain cases of men at the works of the British Mannesmann Tube Company, on the joint application of the two parties.

In all there were six cases in 1913 in which recourse was had to courts of arbitration; and in each instance the court was composed of three members. As from the beginning of this year, a number of additions were made to the list of persons on the panels of the court of arbitration; and the revised list is included in the report.

THE "LANCET" GAS-FIRE TESTS.

In a letter addressed to the "Lancet," Mr. Arthur E. Williams, Assoc.M.Inst.C.E., refers to the series of gas-fire tests instituted by the laboratory staff of our contemporary, the results of which were published in our columns last week, together with an editorial comment. Mr. Williams (who writes from Queen Victoria Street, no number being published) says:

"I have read with much interest the article with this title in the 'Lancet' of April 4; and I consider that you are doing excellent work in bringing into prominence the points in connection with these fires which lead towards greater hygienic efficiency. I notice that 'the fires were tested in the middle of the experimenting room without any communication with the fireplace chimney.' I cannot help thinking that this arrangement was hardly fair to the fires; and in any case it is not an arrangement which would be adopted in actual practice. I take it that all the fires tested (with perhaps one exception) were intended to be fixed in a fireplace with an elbow or flue leading into the chimney, and it would surely have been better to have fixed the fires in such a position for the purpose of testing them. With the arrangement adopted, it is quite possible that the results of the tests made have been to some extent inaccurate in certain cases; and this would account for what would appear to be inconsistency in the results of the tests shown in the diagrams. As an instance of the inconsistency, I would like to point out the difference shown between fire No. 22, 'Merlin' (Wright), and fire No. 25, 'Talisman' (Wright). Under the chemical test the 'Merlin' does not show good results with even a 4-feet flue, whereas the 'Talisman' shows perfect results under all conditions. I believe I am right in stating that the construction of these two gas-fires is identical; the only difference being in the shape of the outside casing—the 'Merlin' being round-topped, and the 'Talisman' square-topped. It would be interesting if you could see your way to make a further series of tests with the fires connected to a chimney in the ordinary way."

With the "Lancet" editorial note appended to the letter, we fully agree: "We publish with pleasure a natural protest without admitting our inconsistency, because the two fires were not identical in every respect. It was stated in the article that the final appeal must be to the chimney and fireplace. We consider that the gas-fire should leave the factory with a hygienic hall-mark, tested under the conditions described, even though they may seem unnecessarily severe."

WORKS TOPICS—XXIX.

By "Modus Operandi."

The Need of a Good Reference Book.

It must be admitted by all that there is a very real need for a good book on gas engineering and manufacture, such as was indicated by Mr. M'Nicholl in his Presidential Address to the Manchester Junior Gas Association. He was merely voicing the opinions of hundreds of other practical men who would welcome with open arms a—to use his own words—"really comprehensive work on modern gas practice." The fact is that the men who would be capable of undertaking so formidable a task—and there are very few who would be capable—are too busy to devote their time to such a purpose. I have nothing to add to Mr. M'Nicholl's suggestion that the best means of carrying into effect this very desirable result would be to divide the work into a number of sections, each of which should be written by a man of proved ability in the particular branch of the work, under the direction of an experienced editor.

There are a number of books on gas manufacture that are quite suitable for students, but very few are of any use to practical men of experience who wish to study from time to time some special points in detail. In the chemical side of our work, there is not nearly so much to complain about as on the engineering side, which has been sadly neglected by competent authors. For the man who knows how to use it, the pages of the Technical Press form by far the best source of information available. It is somewhat tedious to wade through numbers of indexes and heavy volumes; but owing to the absence of the right sort of *vade mecum* there is no alternative. How invaluable would be a carefully compiled index of the original matter published in the Technical Press!

Coal Breakers.

Many engineers will doubtless have studied with interest the drawings and description of the method adopted by Mr. Fletcher W. Stevenson for driving the coal-breakers used at Coventry [see "Journal" for April 7, p. 25]. The arrangement is very ingenious, and should answer the purpose admirably in positions where it is necessary to use direct-coupled breakers. My experience has been with belt-driven breakers; the motive power being supplied by a gas-engine. Although the breakers have been pulled up on scores of occasions, owing to the presence of iron bars in the coal, these have never caused serious damage, which is entirely due to the belt slipping round the driving pulley. This sort of treatment, of course, does not improve the belt, and probably accounts for a shortened life; but I have found in practice that a good balata belt, costing about £3, has lasted long enough to break nearly a quarter of a million tons of coal. Apart from this, no damage whatever has been caused by the pieces of iron so frequently found in the coal. Therefore, while admiring the clever device introduced by Mr. Stevenson, I naturally agree with the comments contained in the "Editorial" [March 10, p. 633] referred to by Mr. Stevenson, to the effect that breakers should be belt-driven.

For direct-coupled breakers this arrangement should be especially suitable; but at first sight it would seem to be difficult to account for the experience at Coventry, where serious fractures of the spur-and-pinion wheels occurred, in spite of the fact that the breakers were belt-driven. In such cases one would expect the belt to come off, or else the pulley to slip round the belt, before any damage could be done to the gearing. The details, however, of Mr. Stevenson's device, which entirely depends for its efficacy on being carefully adjusted to slip whenever an excessive load is transmitted to the gearing, show quite clearly that the same treatment should have been meted out to the belt-and-pulley drive. Had these also been so adjusted in width and size—like the grooved drum and strap—as to cause the belt to slip when the load was too heavy, this first arrangement would probably have been equally successful. Thus the moral would seem to be to arrange that with belt-driven breakers the pulleys and belt should be designed to transmit the coal-breaking load and no more.

While on the subject of coal-breakers, the question of lubricating this type of machine was also briefly discussed by Mr. Moffat, in his paper on "Repair and Maintenance of Gas-Works Plant," and was also touched upon in the "Editorial" to which reference has already been made. The idea of using mechanical lubricators, as explained by Mr. Moffat, does undoubtedly dispose of one of

the small difficulties experienced in working these breakers. The hand pump type of exhauster lubricator has been found very useful for this purpose; but a mechanical lubricator is probably preferable, for the simple reason that it is automatic. In the editorial comments it is suggested that a Stauffer's grease cup takes a lot of beating for lubricating these breaker bearings. This may be so in some cases; but it must not be forgotten that frequently the breakers are completely immersed in coal for hours on end, and the grease cups must perforce be fitted some few feet away from the bearings on the end of a length of tubing. The further the cup is placed from the bearing, the less effective is the pressure exerted upon the grease by the cap, owing chiefly to the grease becoming thickened, especially in cold weather. In my own experience this was the difficulty; and the remedy was found in the use of ordinary oil lubricators where lengths of tubing had to be used, and spring-fed grease cups where the lubricators could be fitted direct on the bearing.

Preventing the Loss of Tar and Ammonia.

It is interesting to notice that Dr. Davidson, in his lecture to the Scottish Junior Gas Association, endorses the value of using a film of light liquid on the ammoniacal liquid in store, as quite recently suggested by Mr. William Wilson in his address to the Scottish Gas Managers. This is valuable independent testimony to the excellence of the idea. In my comments on this subject, the use of oil was recommended; but according to Dr. Davidson light tar oils afforded the desired protection against the loss of ammonia. In many works where carburetted water gas is made the use of light oil-gas tar would no doubt answer the purpose admirably; but in any case, whatever liquid be chosen, the idea is well worthy of adoption.

Dr. Davidson's lecture dealt mainly with the conservation of tar and liquor; and he criticized to some extent modern settings of horizontals designed to make gas irrespective of the yield of liquid products. This is a point in gas manufacture that is not studied as it should be. The use of one ascension pipe in such settings is a case in point, and has often been criticized. It is interesting to notice that the ill-effects of the single ascension pipe are again pointed out in the lecture, though only from the point of view of reduction of liquid products. It is admitted that where single ascension pipes are used, the quantity of sulphur compounds and naphthalene in the gas are both increased. With regard to ascension pipes, there is one point that should not be overlooked, especially when using heavy charges, and that is the use of too large a size of pipe. Pipes of 8-inch and 7-inch diameter are a baneful cause of loss of tar, owing to the excessive condensation of the gas while ascending the pipes to the hydraulic main. It must be borne in mind that all the tar that condenses in the ascension pipes, amounting in some cases to a considerable quantity, is irretrievably lost. Ascension pipes of 5-inch to 6-inch diameter are quite large enough, and will prevent this excessive condensation. Their use is also advantageous in other and obvious respects—such as lower cost in initial outlay, less weight in the mouthpieces, and the reduced size of the augers that can be used.

THE UTILITY OF PRESSURE AND VACUUM RECORDERS.

By F. S.

The use of pressure and vacuum recorders on gas-works has become considerably more general of recent years; and this, perhaps, can be traced in some measure to the popularity of the retort-house governor. If, however, their usefulness is taken more fully into account, it seems that there is still ample room for their number to be increased, and their scope extended. The instruments, whether of the float or dry type, can never entirely displace the water-gauge—it is not intended that they should. Yet their sphere of duty does not seem to be altogether taken advantage of with many manufacturing concerns. One may ask, Over what field does their utility lie? The reply, I venture to think, is: On almost any portion of plant where pressure and vacuum are of importance.

Their presence affords the means of obtaining an abundance of information which, if intelligently studied, can often be employed with profit. These remarks do not apply only to undertakings which are considered lacking in up-to-date management. Discrepancies have been located on works that can well claim to be exempt from this inference; and the inclusion of registers in their stock of gas-works accessories has proved of undoubted value. The return will justify the initial expenditure. It is quite impossible to accurately gauge the condition of affairs taking place inside mains, flues, pipes, &c., which contain gases; but the desirability of possessing this knowledge, or of being in a position to ascertain it, must be admitted by all.

Perhaps the most frequent places where registers are to be seen in use on gas-works are in the governor and exhauster houses. In the former, a daily account is recorded of the pressure supplied to the district; and in the latter case, of the exhaust on the foul main, or at the inlet and outlet of the retort-house governor, if this apparatus is installed. There is no need to comment upon the advantages accruing therefrom at these points. Suffice it to say, if their value is only appraised by the extra care the workmen find it necessary to take in executing their duties where these tell-tale instruments are in operation, this alone, I think, will amply justify their use.

There are other places of equal importance where charts can be taken, though it may not be necessary to run them continuously.

The District.

The actual recorded pressure on the district at various altitudes, over different periods, provides the knowledge which assists the superintendent or manager in overcoming any irregularity of gas supply, and, incidentally, of better serving the public in this respect. It is no uncommon thing to read in our technical journals remarks about the pressure building or backing-up at district or town governors. These terms may be used for the want of a more happy way of expressing a meaning; but I am inclined to the belief that, with the more liberal use of pressure recorders, enlightenment on the subject, to those in need, would be forthcoming.

District mains can be put on test with the aid of a register, though in many cases the scope of the instrument would not be considered sufficient. As sections of mains are often tested at the end of each day's operation, there is no need for the foreman to wait any lengthy period to see the result; for the information will be to hand on his arrival at work the following morning.

Piping Installations.

A system of pipes in large houses or buildings can also be tested, and the magnitude of any defect in the soundness of the pipes, should it exist, can be estimated after a little experience at this work.

The Hydraulic Main.

It requires thought and understanding for an individual who has not received a technical training to accurately explain the effect of pressure and vacuum on the liquor in the interior and exterior of sealed dip-pipes; and not a little imagination is needed to picture in one's mind the conditions operating, when these forces are in action, in conjunction with a setting of retorts under fire. There is mystery here—or, at all events, it appears as such to many—and that is why the hydraulic main possesses so peculiar a fascination for people of an inquiring turn of mind.

Speaking of its function, as the adjustment of the dip-pipes contained therein, and the seal of liquid surrounding the pipes, form one of the most important features in successful carbonizing, there is sound reason why all those who are interested, whether in the dry or wet main principle, should make themselves familiar, as far as possible, with the behaviour of their own hydraulic mains. Needless to say, this is only one of many units that have an influence on high makes of gas; but it is here that the pressure register can be of assistance.

A water-gauge connected to the dip-pipe or main, and fixed in a convenient place, is certainly useful; but there is nothing to equal a recording chart taken over a period of twenty-four hours for showing the result almost at a glance. Fig. 1 is a reproduced chart taken off the bridge-pipe of a retort-setting. Here we have clearly defined the pressure exerted by the flow of gases from the retort, which is at its maximum when the lid is closed following the charging of a retort. After the lapse of an hour or two, there is a gradual decline of pressure; and by the time the retort has again to be charged, there is in some cases a slight vacuum. It will be noticed that there is a decided pull recorded on the chart at 6 o'clock. This is due to the temporary unsealing of the hydraulic main when the tar-tower was being emptied, or when the tar-main was being examined to ascertain if it was working properly.

The Chimney-Stack.

To give an instance of the practical utility of vacuum recorders

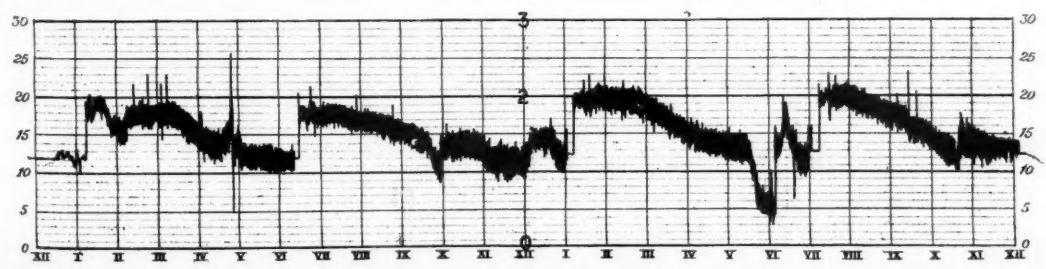


Fig. 1.—Pressure Chart taken off the Bridge-Pipe of a Retort-Setting.

under certain circumstances, I will refer for one moment to fig. 2. This reproduced chart is one of a number which were taken off a chimney-stack with the object of forming a check on the time at which the workmen in charge altered the main damper to comply with given instructions. There is no mistaking the time when the altered vacuum came into operation; and, what is more, the vagaries of the stack over a period of twenty-four hours are clearly shown. In this case, the chart was allowed to remain on some time after its proper period of duration; but this in no way detracts from its value.

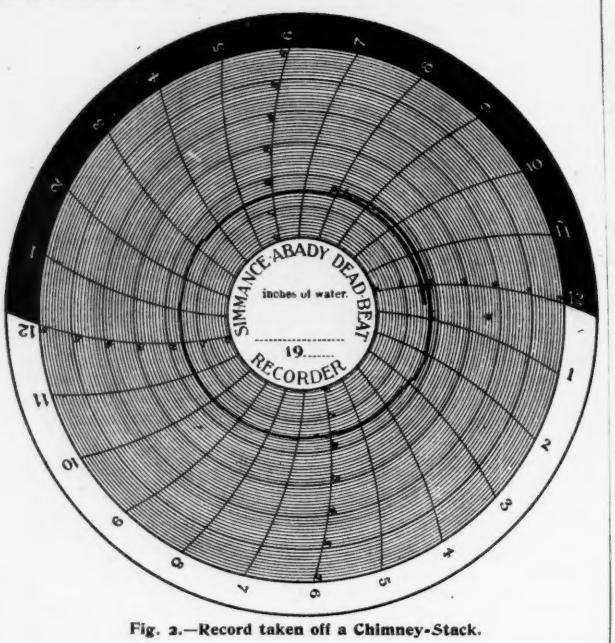


Fig. 2.—Record taken off a Chimney-Stack.

A wealth of knowledge can sometimes be gained by studying charts taken over a time when climatic conditions are varied to the extreme; and a complete answer can truthfully be given as to the dependability, or otherwise, of the stack performing the duty required of it. This I touched upon in a previous article.* The above example has no connection with a gas-works. It was taken on a manufacturing concern where a large tonnage of coal is consumed. The sphere of usefulness of registers is not by any means confined to gas-works.

Some stacks are not so sensitive as others to climatic changes; and the variation caused by wind and weather will not be so marked. There are times when the heat of retort-settings is unaccountably lowered; and the cause is apt to be put down to inefficient clinkering or poking of fires, bad coal, &c. The settings oft-times recover their former temperature in the course of a day or more, without any alteration having been carried out in connection with air-slides or dampers. In numbers of cases of this sort, I think that if vacuum recorders had been attached to the chimney-stack or the main flue entering it, true records of prevailing conditions in the stack would have been indicated on the charts, and the variations in the heating of the retort-settings would probably have been accounted for, without any degree of speculation. Irregular vacuum on a setting, from any cause whatever, results in irregular heating; and when a setting is subjected alternately to extreme temperatures, it is not conducive to good carbonizing returns. The wear and tear of the setting also suffers; and its useful life is thus shortened.

I am not at the moment concerned about remedies for these shortcomings. Some are obvious. But, in passing, it is sufficient to say that three parts of a difficulty of this type can be overcome if the defect is located, and its nature understood. It is impossible to know too much about the behaviour of the plant under our control; and any new light adding to our knowledge often bears a close relationship to the amount found on the credit side of the balance-sheet.

Gasholders.

One more reference is to a section of plant that may be somewhat neglected as regards a continuous check being kept upon its working. Ordinary water or dry types of gauges are almost without exception connected to the outlet of the main of the holder, before it reaches the town governor; but it is seldom convenient during rough weather for an engineer to stand by and watch the gauge, to judge the steadiness of the holder.

A record can be obtained without this trouble; and a comparison between differently constructed types of holders can easily be made. This forms an interesting study, and allows one to speak, with some little degree of confidence, on the steadiness or otherwise of any particular holder. New gasholders should always be tested in this way. The test should be carried out, in preference, after the holder has been filled with air. The speed of emptying it may be varied; and should there be anything to retard the smooth running of the lifts when being lowered, the difference in pressure would be shown on the chart, and the cause could then be investigated, and the test repeated.

The actual reduced pressure which takes place when the holder lifts uncup can be more readily understood by watching the effect on a register chart than by reading its explanation from a book; and I think that this method of obtaining information is commendable to gas-works students.

Conclusion.

In this article, I do not pretend to have touched upon all points that can profitably be taken advantage of in recording pressure and vacuum with the aid of portable or other registers; but if it is the means of creating sufficient enthusiasm in a few to take the subject a step further, or even to induce others to repeat the tests described, I venture to hope that these remarks will have served a useful purpose.

* See "Journal," Vol. CXXII., p. 316.

NEW PATTERN WATER-HEATERS.

The time of year is now upon us again when large numbers of people will be considering the advisability of installing gas water-heaters; and thus it is an appropriate moment for the study of particulars of new patterns of apparatus of this character.

Such particulars are, in an illustrated price list, submitted by the Parkinson Stove Company, Limited, of Spring Hill, Birmingham, who are the makers of the well-known Maughan geysers. One of the new pattern heaters is the "Saxon" circulator, which is arranged for attachment to an existing circulation system without interfering with the coal-heated boiler. Two sizes of this apparatus are quoted (the consumptions per hour, full on, being respectively 40 and 60 cubic feet). It is stated that the smaller one, in about three-quarters of an hour, will heat a 30-gallon hot-water tank to bath temperature. In fact, sufficient water for a hot bath can be provided with a consumption of 25 to 30 cubic feet of gas, costing round about 1d. The water-chamber is of strong copper, tested to 30 lbs. pressure; and the heat is concentrated on the interior surface by means of a special arrangement of cast-iron baffle-plates. A new square pattern of the "Hydrotherm," or automatic geyser, with improved valve, has been specially designed for small houses and flats, where space is a consideration. Its shape enables it to be placed in any corner; and it is operated by the opening or closing of a hot-water tap at any distance. The "Gacylote" hot-water tank supplies hot water throughout the house to any tap below its level; and its action, also, is entirely automatic. Then, too, there is a new appliance, to which the name of the "Gacylette" has been applied, which has been designed to supply small quantities of hot water, for kitchen, scullery, or lavatory. It is a diminutive form of the "Gacylote" cylinder; the two sizes holding respectively 3 and 5 gallons. It is stated that the special internal heating chamber not only enables the water to be heated with one-half the gas consumption required by ordinary means, but keeps the water hot with the exceedingly small amount of 1½ cubic feet per hour—or a cost reckoned at about ¼d. per day. Waste of gas or overheating is prevented by the automatic regulation of the supply. Lastly, there are the several patterns of the "Tottenham" bath-heater, specially intended for use with a small gas-pipe and meter. In this form, water is fed into the top, without any direct connection. When the water is sufficiently heated, the cold-water tap is turned on, and the hot water is driven from the outlet, being replaced by cold. Thus the heater is always full. Owing to the construction of this heater, it is claimed that 10 gallons of water can be raised 80° in temperature in 35 minutes, with a consumption of 21 cubic feet of gas.

From what has been said here, it will be gathered that the firm are in a position to supply water-heaters of many sizes and forms, to suit all sorts of requirements; and this is just what gas undertakings and the public want.

HIGH-PRESSURE GAS LIGHTING IN AMERICA.

Referring to this subject in the course of a paper on "Gas Street Lighting" (noticed elsewhere), read at the last meeting of the Illinois Gas Association by Mr. F. Victor Westermaier, the author made the following remarks.

In view of the development of high-pressure distribution systems in America, it is remarkable that the advantages of high-pressure lighting have not been recognized and advanced. The installations so far made have been mostly of an ornamental nature, for lighting the exteriors of gas office buildings. There are, however, two street lighting installations which have been in operation for a sufficient length of time to demonstrate the practical advantages of introducing large candle-power units where high-pressure gas is available. One of these is at Atlantic Highlands (N.J.), where fourteen 500-candle power units were installed early in 1913. After a year's operation, the service rendered has been so satisfactory that the number of lamps has been doubled, with the prospect in view of a further extension of high-pressure lighting throughout the entire district. The other street lighting installation is at Waterbury (Conn.), for lighting the approaches to the railway

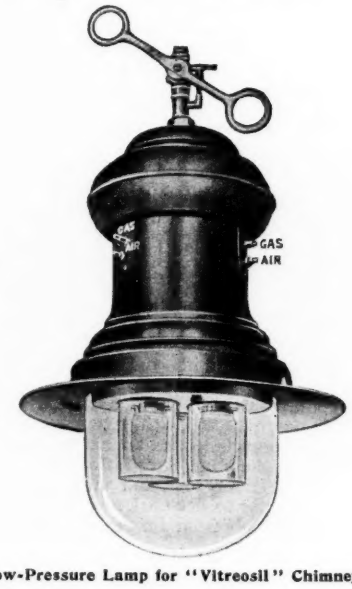
station. The fact of there being a high-pressure feeder line near enabled the local Gas Company to instal seven 500-candle power lamps. These units have given very satisfactory service for more than three years; and had it been practicable to extend high-pressure mains in other parts of the city, additional gas street lighting could have been obtained. The polar curve of the lamps at Waterbury and Atlantic Highlands shows that for street-lighting purposes the distribution of light in the vertical plane from an inverted mantle is much better with high-pressure than with low-pressure gas.

Probably the finest example of street lighting in the United States was shown in Philadelphia during the convention of the National Commercial Gas Association in December last year. Thirty-six lamps were mounted on both sides of a street; high-pressure gas being supplied through a line of 3-inch main temporarily laid on each side of the thoroughfare, and connected with a booster plant in the convention hall. Each lamp was equipped with a mercury-seal distance lighter, located in the base of the post, which opened the gas-valves to the burners when the pressure in the main was raised to the required 3 lbs. per square inch; closing them, and opening the pilot supply when the pressure was reduced to normal. The posts were of special design, to be in keeping with the ornamental character of the lamp. The burners were mounted within spherical globes of "Melilite" glass, 18 inches diameter, resting in ornamental bowls, and capped with bronze ventilators. Two mantles in each lamp produced with a clear globe a mean lower hemispherical candle power of 812, and at 10° below the horizontal a maximum of 1000-candle power. This, with a gas consumption of 21·3 cubic feet per hour, corrected to 60° Fahr. and atmospheric pressure, represents the efficiency of the burner. The "Melilite" globe, used to produce an ornamental and diffusing effect, reduced the light intensity of the burners to a maximum of 575-candle power at 25° below the horizontal, and the mean lower hemispherical candle power to 508 candles. This intensity, distributed over 1000 square inches of globe surface, gave a result not only beautiful but practical.

LIGHTING IMPROVEMENTS BY G. HANDS AND CO.

THOUGH the present is not precisely what one would term the "lighting season," it may be said that improvements in the methods of utilizing gas for the purposes of illumination are never out of season; and as an interview with Mr. George Hands, of Farringdon Road, E.C., has revealed the fact that his firm have quite recently brought out such improvements, opportunity may be fittingly taken to draw attention to them here and now.

Let us take, in the first place, the well-known "Dreadnought" low-pressure high-power lamp for outdoor lighting. One of these was laid out for inspection; and its various good points were enumerated. They are many; and the large measure of popularity which the lamp has achieved shows that they are appreciated.

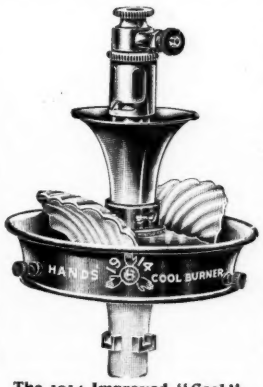


Low-Pressure Lamp for "Vitreosil" Chimneys.

Satisfactory as it has proved in the past, however, Mr. Hands anticipates that still greater satisfaction will be derived from it in the future, owing to the latest addition that has been made to it. This is the introduction of "Vitreosil" chimneys. Gas managers who have seen these on the lamps have been pleased with the effect. The light is found to be particularly pleasant; and the material, owing to the economy resulting from its use, possesses substantial claims to consideration from a maintenance point of view. Hitherto material of this character has not been applied to low-pressure lamps. When used in this manner, the "Vitreosil" is made less dense than is the case for gas-fires; and, as a matter of fact, the firm have tested the lamp, with these chimneys, by a photometer, and found that the lighting efficiency is not affected to the extent of more than from 8 to 10 per cent. by their use, for which they regard the nicer appearance of the light as being ample compensation. The temperature to which the "Vitreosil" is exposed is never sufficiently high to affect it in any way; and therefore, though it adds considerably to the expense of the lamp in the first instance, the heat will not break the chimneys (so causing the smashing of the mantles, and often of the outside globes). Owing to this "unbreakable" characteristic, where "Vitreosil" is used it is not necessary for the diameter of the chimney to be nearly so large as when ordinary glass is employed. Thus the advantage is secured of being able to make the chimney only just sufficiently wide not to touch the mantle.

The "Dreadnought" lamp is built with stout polished aluminium casing; this having been selected as being, in the opinion of the firm, superior for the purpose to a copper casing. As a proof of the assertion that aluminium does not depreciate by showing signs of corrosion or discoloration after being in use, the statement was made that in some installations in Midland towns which have been in operation through the winter, the lamps are still looking practically as good as new. The aluminium casing is attractive in appearance, and should inspire in any maintenance man an irresistible desire to keep it quite bright and spotless. The lamp is also fitted with a large aluminium flue, from which there are no peelings to fall down into the burners. Every part of the lamp is standardized, and readily interchangeable; and the burners are of solid cast brass. The gas and air adjustments are made from the outside by means of a key, so as to prevent the disastrous results, from an efficiency point of view, which follow on tampering with lamps by consumers or others who do not properly understand them. A patent flash-light single-jet bye-pass is made to light up the three burners, which, of course, reduces the consumption of bye-pass gas. The reflector plate above the burners is attached by two screws, and is thus easily removable. These reflector plates—to which the chimneys are attached—are interchangeable, so that either glass or "Vitreosil" chimneys may be used. Any purchasers who have lamps arranged for glass chimneys who may desire to replace these by "Vitreosil," have merely to procure a new plate and fit it in the lamp. Should it at any time be necessary to get at the interior of the lamp, all that has to be done is to unscrew a single nut at the top of the casing.

Equally well known as the lamp just described is the Hands "Cool" inverted burner, for interior lighting; and this also is now made in an improved form. The firm lay claim to being the pioneers of burners designed on lines to prevent the discoloration of fittings; and their 1914 pattern is a considerable improvement on its predecessors. Not only are the fittings preserved from discoloration by heat or spent products, but the burner itself has no part which can be attacked in this way, as the "wings" protect the upper portion, and there is a patent double ring on the globe-carrier. Between the two rings there is room for air to circulate; and the result is that the inner ring takes all the heat.



The 1914 Improved "Cool" Burner.

The burner is made also in china, with a loose ring which can be dropped over the brass ring, so that should the loose ring at any time be broken it is a simple and cheap matter to effect a replacement. In the new pattern, the globe-holder itself is considerably reduced in size as compared with what it was previously. As to the already good efficiency of the burner, it is claimed that this has been further increased by the provision now of a second air inlet below the ordinary air inlet. This draws in air which has been heated in passing round the upper part of the burner to the inlet.

The "Cool" burner, being solidly made and of good design, looks well, acts well, and lasts well; and as Messrs. G. Hands and Co. have discovered a more satisfactory manner than hitherto of manufacturing it, this has enabled them to produce a better burner at a cheaper rate than the old No. 3 pattern.

The production of briquettes and coke from peat is the subject of a French patent lately taken out by MM. Prioleau. The briquettes may be carbonized in retorts to produce coke.

COAL WASHING.

By F. C. Lincoln, Assistant Professor of Mining Engineering.

The following extract is made from a Bulletin (No. 69) recently issued by the Engineering Experiment Station of the University of Illinois. Although the publication deals chiefly with American practice, we have no doubt that readers on this side will find it of interest.

During the year 1912, a little under 20 million tons, or 4·4 per cent., of the total bituminous coal produced in the United States, was washed; yielding in the result 88·4 per cent. of washed coal, with 11·6 per cent. of refuse. In Illinois alone the coal treated amounted to 5·88 per cent. of the quantity produced; giving 12·8 per cent. of refuse.

The history of coal washing is dealt with, from the earliest method of screening and hand-picking to the latest mechanical arrangements; many of the latter being illustrated and described. Washing removes from the coal those impurities that are only loosely mixed with it, and which as far as Illinois coal is concerned, consist of shale, fire-clay, bone, pyrites, gypsum, calcite, and moisture. The separation, of course, depends on the difference in density found between the coal and its impurities; such difference being readily seen from the following figures relating to substances from a mine of the Consolidated Coal Company.

	Specific Gravity.
Coal	1·25
Bone	1·45 to 1·80
Shale (slate)	2·25 ,, 2·50
Coal with pyrites	3·20 ,, 3 60
Pyrites	5·00 ,, 5·20

It is considered probable that further investigations would result in compositions being found giving every graduation in density from pure coal to pure shale, and from pure coal to pure pyrites and so on.

The ash varies in a general way with the content of solid impurities. The variation is not, however, exactly proportional to the impurity content, because the impurities are not composed entirely of ash, but contain varying percentages of it. Approximate analyses of the two most common impurities, shale and pyrites, will serve to illustrate this:

	Gray Shale.	Octahedral Pyrites Crystal.
Volatile matter, per cent.	7·19	25·97
Fixed carbon ,, ,,	0·93	7·24
Ash ,, ,,	91·88	66·79

These figures indicate that, with two impure pieces of coal of the same specific gravity, one with shale impurity and the other pyrites, the ash would be much higher in the case of the coal containing shale. In the case of any given coal, the ratios of the various impurities present are likely to remain fairly constant; so that the variation in ash will be very nearly in unison with the variation in specific gravity. Similarly, the heat value in British thermal units of a given coal will decrease with a fair degree of regularity with an increase in ash and specific gravity.

Discussing the theory of washing, it is pointed out that if a piece of coal and a piece of shale of the same size and shape are dropped into water at the same time, the shale will reach the bottom first, because its weight is greater, and the surface it presents to the water to be acted on by friction is similar. If the same piece of coal is dropped into water with successively smaller particles of shale of the same shape, the difference in time of fall will be reduced, because the proportion of surface to weight, and therefore the friction per unit weight, increases with decrease in size. Finally, a particle of shale will be found of such a size that it will settle at the same rate as the piece of coal. The ratio of the diameters of this coal and shale will be conversely as the ratio of their weights in water. Thus—

$$\frac{D}{D^1} = \frac{S^1 - 1}{S - 1} \quad \text{where}$$

D is the diameter of the coal, and S its specific gravity; and D^1 and S^1 being the diameter and specific gravity respectively of the shale. To give an example: Coal of specific gravity 1·2 and shale of 2·4, the ratio is 7; showing that the coal with a diameter of 7 will settle at the same rate as a similarly shaped piece of shale with a diameter of 1.

When particles of coal and impurities are dropped into a stream of water moving horizontally, they will describe parabolas. The more rapidly falling particles will reach the bottom first after the shortest exposure to the horizontal force of the stream, and will therefore have been carried the shortest distance. Conversely, the slow falling is carried to a greater distance. This principle is applied in practice; a trough being constructed of such a length, and operating with such a stream of water, that the largest particle of coal treated will be carried just the full length of the trough. With it will be carried equal settling particles of all impurities, together with all smaller sizes of impurities, and all the coal; while all impurities larger than those which are equal-settling with the largest coal will remain in the trough, to be removed and disposed of as refuse.

A grading box makes use of the same principle. It consists of a trough with openings in its bottom at intervals, through which groups of particles, which are equal-falling under free settling conditions, are drawn off. The continuous removal of a portion of the stream with each group of grains decreases the strength of the current, and results in a more rapid dropping of the particles, than if the velocity of the stream remained constant, as in the trough washer. The object of the grading box is not to produce a finished product, but to prepare the raw coal for still further treatment.

If a crowded mass of particles of coal and impurities of different shapes and sizes is subjected to a rising current of water which is not so swift as their free-settling velocities, and so will not carry them away, but yet is strong enough to keep them in motion, they will arrange themselves in layers having definite ratios dependent upon their specific gravities and shapes. The ratios are larger than for the same particles under free-settling conditions, and are called hindered-settling ratios. This increase in ratios may be explained on the ground that under hindered-settling conditions the classification is brought about by means of a quicksand which is of higher specific gravity than water, but otherwise works in a similar way. The formula then becomes

$$\frac{D}{D^1} = \frac{S^1 - s}{S - s}$$

where D, D^1, S, and S^1 have the same meaning as before, and s signifies the specific gravity of the quicksand. Considering the coal and shale of specific gravity 1·2 and 2·4 respectively, and supposing the mixture of coal, shale, and water forming the quicksand to have a specific gravity of 1·1, the hindered-settling ratio is 13; or, correcting for the difference in shape between coal and shale, 11. All the washeries in Illinois are worked on hindered-settling conditions.

The tub washer is the simplest form of hindered-settling washer, and consists of a hollow inverted cone, at the bottom of which a rising current is introduced, which, with the help of mechanical stirrers, keeps the mixture of coal and impurities agitated. The larger impurities settle to the bottom, where they are drawn off intermittently; while the coal and smaller impurities are discharged at the top.

In the jig washer, there is an intermittent rising current, a succession of pulsions, or, by alternately rising and falling currents, pulsions and suctions. The currents pass through a screen upon which the material rests, and are either produced by the movement of a piston, as in piston jigs, or by the movement of the screen in pan jigs. The coal and refuse are discharged continuously at the top and bottom respectively. In order that the water shall work evenly over the whole area of the jig, it is necessary that a thin loose layer of the impurities mixed with the coal be maintained over the screen.

In the bumping table, the wet material, resting on an inclined table, is subjected to a succession of bumps, tending to move it up the table; the material becoming stratified in equal-settling layers. The upper layers, containing large coal and small pieces of impurities, are washed off the lower end of the table by the stream of water; while the lower layers, containing the large impurities, are bumped up the table and off at the top.

Improvement Effected by Washing.

In the following table, "face" designates the samples taken across the working face of the coal bed, excluding shale and sulphur partings, which the miners are supposed to remove. The fact that the sulphur content of the face is about equal to that of the mine-run may be explained on the ground that sulphur partings, which should be excluded, find their way into the coal as mined; but the extra sulphur thus introduced is diluted with sulphur-free shale from floor, roof, and partings.

The figures given refer to dry coal, and represent the average figures of a number of tests from different fields.

Illinois Coal.

—	Raw Coal.			
	Face.	Mine Run.	Lump.	Screenings.
Ash, per cent.	9·60	14·58	9·66	20·81
Sulphur ,,	3·30	3·29	2·67	3·84
B.Th.U.	13,007	12,199	13,068	11,166

—	Washed Coal.					
	Screenings.	No. 1*.	No. 2.	No. 3.	No. 4.	No. 5.
Ash, per cent.	9·81	8·53	8·31	8·96	9·60	12·65
Sulphur ,,	3·03	3·11	2·98	3·12	3·00	3·13
B.Th.U.	12,959	13,125	13,180	13,095	12,935	12,445

* These numbers refer to the size of the coal; the range being in inches.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Between	1¾ to 3½	⅞ to 2¼	⅜ to 1¼	3/16 to ⅜	0 to 1/16

Regarding the percentage of moisture in washed coal, this depends upon the size of the coal, weather conditions, &c., but is approximately 10 per cent. over that of the normal sample.

Mr. James K. Hesketh, of Knutsford, Chairman of the Northwich Gas Company, and a Director of the Knutsford Light and Water Company, who died on Nov. 10, aged 72 years, left £46,598 gross and £15,992 net.

STOP WASHING

AND SCRUBBING YOUR GAS AND USE THE

SIMON-CARVES

PATENTED

DIRECT-RECOVERY PROCESS

LOOK WHAT IT MEANS

Ammonia Scrubbers and Washers are entirely dispensed with.

No Ammonia Stills are required.

No lime is used; therefore there is no limy or noxious effluent to be disposed of.

No "Devil Liquor" is formed; the condensation from the coolers being perfectly inoffensive and practically distilled water.

No storage or handling of Ammonia Liquor with consequent large loss of Free Ammonia.

Higher yield of Sulphate.

Candle power is improved owing to the early separation of Tars.

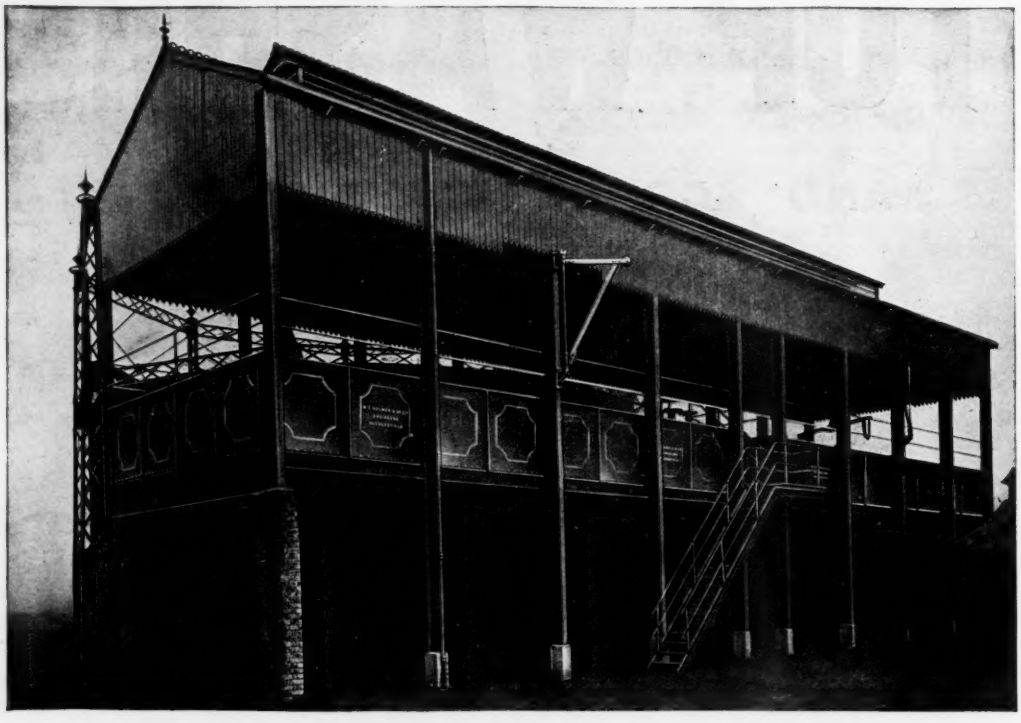
Perfectly White Salt.

The Process is simplicity itself.

MAY WE QUOTE YOU.

SIMON CARVES LD., 20, Mount Street, MANCHESTER

PURIFIERS & STRUCTURAL STEELWORK



W. C. HOLMES & CO., Ltd., Whitestone Ironworks, **HUDDERSFIELD.**

CAST IRON PIPES FOR GAS OR WATER.

MADE FROM SELECTED PIG IRON,

Best Value in the Trade.

Sockets, Weights, and Thicknesses varied to Engineers' Specifications.

8 TO 10,000 TONS IN STOCK, MADE IN DIAMETERS 1½ IN. TO 80 INCHES.

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

A. G. CLOAKE,
54, HOLBORN VIADUCT, LONDON, E.C.

CARBURETTED WATER GAS.

ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LTD.

announces

REVOLUTIONARY IMPROVEMENTS.

13, Victoria Street, London, S.W.

THE CARE AND MAINTENANCE OF THE "FIDDES-ALDRIDGE" SIMULTANEOUS RETORT CHARGING-DISCHARGING MACHINE.

By H. C. WIDLAKE, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Concluded from p.* 121.)

THE MOTOR.

THE Siemens "C" type motor supplied with these machines needs extremely little attention. The oil wells should be drained out once a week, and the supply pipes cleaned by filling the small lubricating box with paraffin and allowing same to run through the bearings and out of the drains, after which the plugs should be screwed-up and the box refilled with the ordinary lubricating oil. The motor commutator should be daily inspected when on load for sparkless running and for end-play. The reason for the latter will be dealt with later.

The motor should be changed, cleaned, and thoroughly overhauled every six months—March and September being the best times to effect the exchange in a one-machine installation. Three or four hours should be allowed for carrying out the change, for which purpose a spare motor, solenoid brake, and two half couplings should be kept in readiness.

In making the change, the following points should be noted, and compliance with them will be found to save much delay and "fur flying."

1.—The charging platform should not be lowered right down, but should be left, resting on the safety bearers, at a sufficient height to allow of a man making his way underneath, and finding and replacing any bolts which may drop down during the removal of the motor.

2.—While the motor holding-down and coupling bolts are being slacked off, the brake and its bracket, but not the drum, should be completely removed, and the resistance, together with the guard rails on the boarding platform, taken off and placed on one side—care being taken to properly label the leads between the controller and resistance.

3.—The motor, having been disconnected and its leads labelled, may now be carefully lifted and swung out by means of a main tackle rigged across the top of the machine and a set of auxiliary blocks hanging about 3 feet from the near-side sill plate; the latter being to draw the motor away from the machine and drop it down by the side.

Great care should be taken that no damage is done to the motor leads in swinging the motor out—a risk which, in the machines under the writer's care, has been eliminated by fitting the motors with four terminal pillars on the top of the motor casing, through which they pass *viâ* insulating bushes; the old holes in the side of the casing being tapped and plugged. Connection between these terminals and the brush gear and field coils is made with taped copper strip of suitable section; while the leads from the controller and that from the brake solenoid are fitted with ordinary thimble terminals.

The old motor having been lifted out, advantage should be taken of its absence to examine the worm-box; particular attention being given to the thrust plates at the ends of the worm, which, if found to be worn, should either be replaced or the wear may be taken-up by adding an additional plate, any final adjustment being made by a liner between the machined ends of the box and the thrust flanges.

The chances of a sudden failure of this thrust gear is very remote; but it may be caused by the fracture of these plates or the stripping of the bolts securing the thrust flanges to the box. The result of such a failure is to throw upon the motor the duty of taking the thrust; and it speaks highly for the excellent mechanical construction of these motors that the author knows of a case in which a Siemens "11 C" motor did actually operate for several days under such abnormal conditions. The ultimate result of this failure is that the motor bearings are displaced along the longitudinal axis, and the commutator connecting lugs come into collision with the brushes.

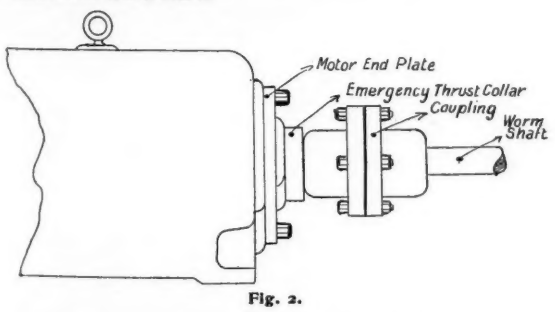


Fig. 2.

A simple way to obviate this possibility is shown in fig. 2, where it will be seen that a gun-metal collar is interposed between the motor half coupling and the end bearing shield; being secured to the shaft by a light set-screw. In the event of a failure of the thrust gear, this collar acts as a distance-piece between the coupling and the motor; and the blow due to the travel of the worm under these conditions is taken by the whole motor and not *viâ* the bearing bushes. This can be quickly detected and remedied before any damage is done, whereas in the absence of this collar the armature would soon be forced into collision with the brushes and a bad breakdown caused.

The bed on which the motor rests will be found to consist of a cast-iron machined plate bolted to the main joists of the platform. This should be cleaned off and its holding-down bolts tested for tightness—an operation which is very difficult once the motor is in place. This machined plate is recessed on the under side for the reception of the heads of the motor holding-down bolts, and care should be taken to see that these bolt-heads are actually right up and not catching on the edges. The motor having been bolted in place and connected up, should be given a preliminary spin, after which, and providing it is satisfactory, the brake may be fixed in position.

The brake bracket should first be loosely bolted to the side of the motor, and the top and bottom brake band castings placed respectively on top of and under the drum. By means of a short, steeply tapered bar, it will be found easy to get the three holes in these fittings coincident, when the fulcrum pin may be passed through both the bracket and the two halves of the band. The bolts securing the bracket to the side of the motor must now be tightened-up and the setting proceeded with.

Proper setting of this type of brake is a rather delicate job, calling for a certain amount of intelligence and skill; and discrimination should be exercised in the choice of the man detailed for this work. The main purpose of the brake is to arrest the charging gear after it leaves the retort-mouth. A loosely-set brake may mean an over-run of the chain; while, on the other hand, a brake which does not properly leave the drum causes the motor to heat, due to increased current consumption, with an accompanying reduction in the economy of the machine, and will, in all probability, lead to a hot bearing at the brake end of the motor, due to mechanical friction. The writer proposes to give a detailed description of the manner in which this brake should be set. It may be pointed out that a brake should be reset about every week or ten days to take up the wear on the blocks, which, under normal conditions, last the six months which has been mentioned as the fair length of continual service for a charger motor.

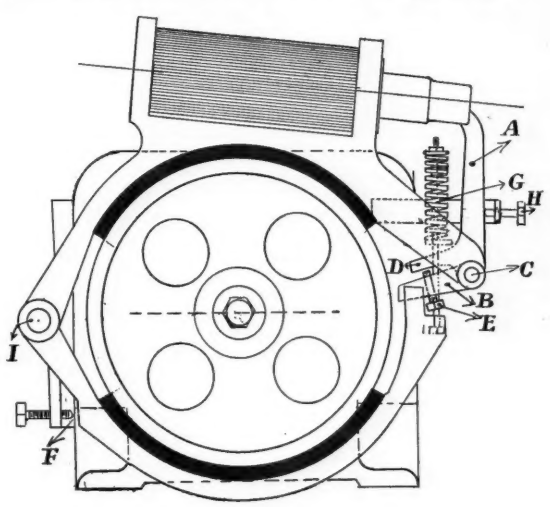


Fig. 3.

The brake is of the solenoid type, and is so constructed that the passage of current through the motor, with which the brake winding is connected in series, releases the brake drum in the following manner (fig. 3). The outer end of the solenoid engages with a fork in the top of the lever A, which, in common with the trigger B, works on a fulcrum pin C, passing through the outer end of the upper brake block casting. The lever follows the solenoid on its inward stroke, and has cast upon it a step D, which, coming into contact with the adjusting screw E in the trigger, imparts a downward motion to the trigger. The trigger will now give a downward motion to the lower brake block casting (on the extremity of which it rests), and this, moving about the back fulcrum pin I, leaves the drum and comes to a rest when it meets the adjusting screw F. The lower brake casting having completed its stroke, which is limited by the screw F, the top brake casting now commences to lift, until, at the end of the plunger's stroke, both top and bottom brake blocks are quite clear of the drum.

Before passing to the setting of the brake, it may be pointed out that the plunger should be withdrawn, cleaned, lubricated, the solenoid cleaned, and the plunger replaced every fortnight. A certain amount of coal dust, &c., is bound to be carried forward with the plunger, and this, unless periodically removed, will eventually "bind" the brake. The plunger may be lubricated with vaseline; but under no condition should oil be applied to the brake blocks—a practice which is far from uncommon, and cannot be too strongly condemned. If excessive heating or firing is taking place, it is due to the setting of the brake; and the application of oil to the blocks can only make matters worse.

Setting the Brake.

The top and bottom castings having been set in position as described, the adjusting screw F should be set forward until the bottom brake block is just clear of the drum. The compression spring G must now be put in position and slight tension exerted, which will have the effect of applying both top and bottom blocks to the drum. The adjusting screw E in the trigger B must next be screwed forward until its point is about $\frac{1}{8}$ inch away from the step D. The position of the step D may be regulated by means of the screw H, which regulates the travel of the solenoid. With new blocks, however, this screw should be so set that, with the point of the screw E just projecting through the trigger B, the distance of $\frac{1}{8}$ inch mentioned above is maintained.

The required braking effect may now be attained by regulating the tension of the spring G by means of the tension nuts on the top of the bolt passing through the spring and connecting the top and bottom halves of the brake. All adjusting nuts should be securely locked, and if the blocks are new, the adjustment should be followed up daily for a week or so, until the blocks have bedded themselves to the drum. If overheating at the brake occurs when all the adjustments are correct, and the blocks are observed to leave the drum properly, the thrust gear should be closely examined, as in all probability the overheating is caused by end-thrust, which can only occur through failure in the thrust boxes.

Any backlash, however slight, that may be detected in any of the motions should be immediately located and remedied, as a defect of this nature, if not given attention to, will develop to such an extent as to cause this particular part of the gearing to assume the characteristics of a shearing machine. In this, and, indeed, in all heavy duty machines, the proverbial "stitch in time" will be found to save, not nine, but many times nine.

The Use of the Safety Bearers.

By the safety bearers, the author refers to those bars which, passing through the outer frame of the machine and resting in stirrups bolted to the corner joists of the same, are intended to arrest the fall of the machine in the event of any breakage of the suspension ropes or of the failure of the pawl gear on the top of the raising clutch. The writer would, at this point, call attention to the fallacy of the belief that the presence of a worm reduction in a train of transmission gear ensures that the gear will be positively braked at any stopping position.

The likelihood of a worm being motored by any strain on the gear which it drives increases with its "steepness." But it will be found that a worm which actually does hold a certain load ceases to be a factor of safety if, from any cause, it is given a start, however slight, in the direction in which its load would tend to "motor" it. Applying this statement to the raising motion of the "F.A." machine, it may be remarked that, once started, the worm would be motored by the weight of the inner frame, and would immediately attain a high velocity, and could not introduce any appreciable time-limit into the descent of the machine.

The writer strongly advocates the use of two sets of bearer bars with each machine—one set to be placed in a required new position before the other set is withdrawn, thus ensuring that at no moment is the machine without a set of bearer-bars under the inner frame. The machine having been raised or lowered as required, the raising clutch should never be withdrawn until the bearer bars have been placed in their new position. The upper portion of the raising clutch carries a broad ratchet wheel, the teeth of which, at the moment of withdrawal, engage with a pawl carried on the main charging wheel bearer. This pawl should be so set as to ensure that it is positively engaging with the ratchet before the two elements of the raising clutch are actually drawn apart.

Levelling-up the Inner Frame.

During the periodical inspections, the strands of the wire ropes should be closely examined for any signs of fracture, particularly at the fastenings, the regulating buckles examined, and the floor of the inner frame tested with a spirit-level and, if necessary, levelled-up by means of the aforementioned buckles. A record kept of this test will indicate a tendency to unequal elongation on the part of any particular rope.

Periodical inspection in these and in all such heavy duty machines can do much to minimize the chances of breakdowns Though the writer does not for a moment suggest that machines working in a retort-house can be kept like a generating set in a power house, he strongly urges that a state of reasonable cleanliness should be maintained, and no accumulation of dirt, coal dust, &c., permitted, particularly in the neighbourhood of the bearings, clutches, switch gear, and motor. Although the motor is of the totally enclosed type, the author's experience shows that a considerable amount of dirt can, and does, accumulate in its interior, owing to the commutator inspection lid being lifted without the top of the machine having been well brushed off. Both this lid, and the side inspection doors should be kept tight in order to exclude all dust, &c., the presence of which in the motor may soon be detected by a drop in the insulation resistance of the field windings. Apart from this, there is the danger of the formation in the motor of an explosive mixture of gas, which may be ignited by a spark from the brushes.

Both motor and controller should daily be blown out by means of dust bellows. In this connection, it may be observed that in a works where there are several motors the installation of a portable electrically driven air compressor for this purpose is a profitable investment, on account of the state of cleanliness that can be maintained by its means, and the consequent freedom from those electrical troubles which are so often caused by dirt.

It is not an uncommon thing to find a machine of this type working single-handed in a house containing such a number of settings as to necessitate its continual operation—a "penny wise and pound foolish" policy which can only be characterized as unfair to the machine, to its makers, and to the shareholders of the undertaking pursuing it. In an installation of this size, the money expended upon the installation of a second machine will soon be saved by the reduced repair bill, the freedom from those breakdowns which must occur on a machine, which, however well-designed and built, has to take heavy duty continuously, and the cost of manning a large retort-house for hand charging in the event of such a breakdown. Even greater than these considerations is the diminution in the "make," which is consequent on recourse to hand charging by men, who, after a long period of inactivity in this class of work, are comparatively inefficient.

A Modified Type of Machine.

The writer proposes to describe a modification by which the capacity of any existing machine can be materially increased without detriment to the machine; and, if the following notes are in any way incomplete, he would be glad to give any further information to any interested person who may care to communicate with him. The "11 C" Siemens crane-rated motor used on the "F. A." machine is in every way admirably adapted for this purpose; but in an installation where the machine has to run continuously for long periods, it is found that the motor attains an unduly high temperature, due to the fact that, under these conditions of service, it operates at a much higher rating than that for which it was designed.

The modification here alluded to consists of the provision of a

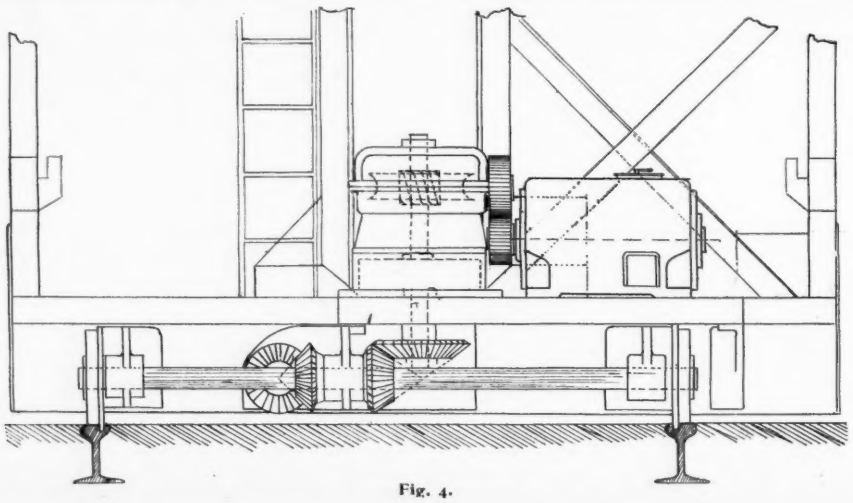


Fig. 4.

second motor to operate the travelling gear; and a recent addition to the plant with which the author is connected is a "F.A." machine equipped in this matter, the excellent results given by which have more than justified the considerations which led to this radical departure from Messrs. Aldridge and Ranken's standard design, with which, it may be observed, all the other details of the new machine are in accordance.

Fig. 4 shows a sketch of the travelling gear of this machine. It will be seen that the travelling worm box on the charging floor, the travelling clutch and gearing, and the vertical travelling shaft of square section, have been dispensed with in this design. An "11 C" Siemens type motor mounted on the near sill-plate drives through a single reduction gear a worm box fitted with a downward extending shaft, which, passing through the bearing under the sill-plate which previously carried the vertical shaft, terminates in the bevel wheel driving the near axle. The motor is fitted with a raw-hide pinion to ensure noiseless running; but the writer is of opinion that an all-steel gearing running in a totally enclosed heavy oil bath would prove equally effective in this particular respect.

The motor is connected, *viâ* compensating gear, with the main controller through a change-over barrel type switch placed immediately in front of the operator and behind and above the main controller.

The diagram (fig. 5) shows the connections between the main controller and the two motors. It will here be seen that a safety device is installed on one lead of the travelling motor. The device consists of a "wipe" contact fitted to the end of the chain wheel shaft, to render it impossible for an operator, in a moment of abstraction, to travel the machine with the charging chain in any but the "home" position. The machine has a top travelling speed of 108 feet per minute, which can, of course, be reduced at the controller if desired; but no difficulty is experienced in picking up a full charge of coal at this speed.

The advantages which have been found to accrue from the adoption of this modification are as follows:

A.—The machine takes up its position in front of a retort and is ready to charge the same in a much shorter time, owing to the ease with which, by simply throwing over a small switch, it is possible to change from the travelling to the charging-gear, and *vice versâ*. As a result, the retorts are open for a much shorter time than is the case with the one-motor machine.

B.—Controller maintenance is greatly reduced, owing to the absence of the destructive arcing which takes place when the motor has to be "edged" around in order to release and engage the respective clutches.

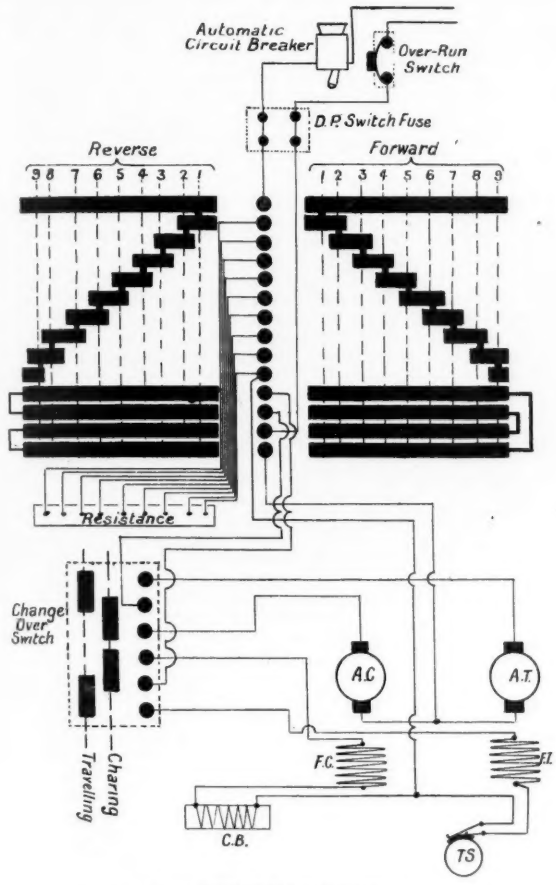
C.—The charger motor operates nearer its rated capacity at a lower temperature, and the load factor on both the motor and on the transmission gearing is greatly reduced.

D.—Even a breakdown of the travelling motor need not put the machine out of action, as, the worm being taken out of the travelling worm box, the machine can, in an emergency, be drawn from retort to retort.

E.—The absence of the heavy travelling gear box on the charging floor gives greater facilities for inspection and for the carrying out of running repairs.

F.—Owing to the reduction of frictional losses, the travelling gear possesses a higher mechanical efficiency and operates at any given speed with a correspondingly smaller consumption of current.

This gear can easily be fitted to an existing single motor charger, and will considerably increase the capacity of such a machine, at the same time rather reducing the load factor on the individual parts.



A C.—Charging Motor Armature.
A T.—Travelling ,, ,,
F T.— ,, ,, Field.
F C.—Charging ,, Field.
C B.— ,, ,, Brake Solenoid.
T S.—Travelling Gear Safety Switch.

Fig. 5.

The material for the foregoing article has been furnished by the closest practical association with the "F. A." charging-discharging machine; and the various recommendations made are those the adoption of which in connection with the installation of the machines at the Plymouth and Stonehouse Gas-Works, have largely contributed to low running and maintenance charges and to a generally economical and efficient state of affairs.

In conclusion the author would like to tender his sincere thanks to Mr. Percy S. Hoyte, the Chief Engineer of the Company, by whose courteous permission these notes have been published, and to whose encouragement and collaboration their success, from a standpoint of practical utility, is largely due.

SYSTEM OF HEATING AND LIGHTING BY GAS AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

A SCIENTIFIC SCHEME OF PIPING FOR HIGH-PRESSURE DISTRIBUTION DESCRIBED IN DETAIL.

By Guy R. Kinsley.

Gas is to be an important and versatile factor in the success of the Panama-Pacific International Exposition. Gas will share with "Old Sol," who smiles perennially in San Francisco, and the matured descendants of the modest electricity that Franklin lured to stay in England, the glory of "enlightning" the world to its progress. To gas also falls the duty of driving the chill from great buildings at night, and feeding at any hour hungry mouths that may crave any food from hot bouillon to a *table d'hôte* dinner. Added to these will be its part in the spectacular light effects that are to transform the various courts.

And then, as if these functions were not sufficient to employ one agency, gas will literally and figuratively "blaze" the way for the coming decade's progress in the science of heating and lighting and several contributory fields. The exposition is to be a pathfinder for the latest inventions in these lines, and for ten months the grounds will be a vast experiment ground and station for the observation of world experts. When this period is ended, success or failure will be emblazoned to every clime on the globe where civilization may bend a listening ear and turn a watchful eye.

The very system by which the 635 acres of ground are piped for the demands that are to be made in 1915, is a testimonial to the great advance that has been made in a branch of the gas distribution science that was almost unknown at the time of the Louisiana Purchase Exhibition in 1904. St. Louis gas engineers engaged in solving the Exposition's problem of gas supply at that time found the Exposition removed from the centre of gas distribution, which placed them at a disadvantage, for they had no large gas-feeders. They depended on a low-pressure gas delivery from the St. Louis mains.

Since 1904, there have been rapid strides in the development of high-pressure gas distribution, both for direct service and for boosting or reinforcing low-pressure systems. The Panama-Pacific International Exposition grounds are fortunately situated so far as gas delivery is concerned by being located directly on a high-pressure loop extending from the gas-works at the south-end of the city almost around San Francisco to the North Beach holder station.

This loop is a 16-inch steel main, and its approach to the North

Beach is through Webster Street, which is almost the spine of the exhibition grounds. From this 16-inch main is taken an 8-inch steel loop extending completely around the grounds. Another loop of 4-inch steel pipe circles the State and Foreign Pavilion sites. The portion of the Exposition grounds east of Webster Street, including the amusement concessions, will be supplied from an 8-inch steel loop.

The reason for extending these gas-mains in the form of loops is to avoid what are generally known as "dead-ends." These are the terminals of gas-mains farthest removed from the source of supply; and in these "dead-ends" there is naturally a reduction in pressure according to the amount of gas taken from them, until at the point most remote the pressure is low and the service unsatisfactory. This refers mainly to low-pressure gas distribution, but would also apply in a measure to high-pressure distribution. Experience of past expositions has proved the disadvantages of both low pressure and "dead-ends."

By laying gas-mains in loops returning to the source of supply equalizes the pressure, and provides a system where the circulation of gas is perfect and the pressure uniform. Low-pressure distribution is always considered as that force which is exerted on the gas by the weight of the gasholder or by rotary boosting fans, and the pressure is measured in terms of inches of water in a syphon pressure-gauge. Low pressure is commonly employed for cooking, lighting, and heating, and the pressure is from 4 to 6 inches, or about one-seventh to one-fifth of a pound to a square inch. This was the pressure of gas given other expositions that utilized gas on the grounds and buildings. A requisite for low-pressure distribution which has been lacking in past systems is the laying of large mains. They should also be large enough for any unusual demands.

All of these defects are obviated by the high-pressure system installed at the 1915 Exposition grounds. The gas is delivered into steel mains of smaller size under pressure measured by pounds to the square inch; and the pressure is reduced, by a regulator at each consumer's meter, to a pressure in inches of water necessary to give the best results for the particular purpose for which the gas is to be used.

For instance, for ordinary incandescent gaslight, a pressure of from 4 to 6 inches is most satisfactory, while for industrial uses pressure to as high as 1 lb. may be employed with greater satisfaction and economy. For the latest installation of high-pressure lamps for street lighting—such as are now seen in London, Paris, and Berlin, and which will be used for lighting the amusement and other streets at the Exposition—a pressure of 2 lbs. applied directly to the mantle gives the greatest lighting efficiency.

Another advantage of high pressure over low pressure is the ability to increase the supply of gas by increasing the initial pressure. In the low-pressure systems, the increase in demand can only be provided for by the installation of larger pipes, or boosting the low pressure, with consequent leakage of the joints of cast-iron mains.

In this matter of joints and mains the system prepared by the Pacific Gas and Electric Company for the International Exposition is far in advance of any used anywhere, whether in an exposition or community. The San Francisco Company is the pioneer, and the Panama-Pacific International Exposition is the greatest demonstrator in the world of a loop system without joints. And it is a system of more than 9 miles of pipe within the fence that encloses the world enterprise.

All the steel tubes are welded together by the oxy-acetylene torch, using rods of Norway iron for the welding material. These welds are actually stronger than any other section of the great steel pipe; and the mains when finished will consist of an endless welded tube without leaks. They are tested for leaks under a pressure of 100 lbs. to the square inch. When they have proved to be tight under this pressure, they will be absolutely tight under the working pressure of 40 lbs. to the square inch, maximum, which will be supplied to the Exposition. The average pressure will be nearer 30 lbs. In Geary Street, San Francisco, the first strip of welded steel pipe ever laid for high pressure was installed about two years ago; and the Exposition test will be of great value in demonstrating the advantages of the new plan.

In the matter of measuring the gas supply for the Exposition, there will be two of the latest meters, and scientific men will be able to watch this invention in an unusual test. Two Thomas electric gas meters will be used to record the flow of high-pressure gas. The gas that passes through the meter is heated by means of an electric current, and a careful measurement of the quantity of electricity employed, and the rise in temperature of the gas, supplies the factor for determining the exact quantity of gas measured.

The gas that will be used is made from the California crude petroleum by a processs which is itself Californian. It is produced from the oil with practically no bye-products. The gas is remarkably free from sulphur and other impurities. Its illuminating power is about 19-candle power, and it has a heating value always in excess of 600 B.Th.U. per cubic foot. It is expected to provide an ideal fuel for heating, cooking, illuminating, and all other purposes within the fair grounds, coupled with convenience and safety, which are not enjoyed when solid or liquid fuels are used.

A part of the Exposition lighting system will, in fact, be an exhibition of high-pressure gas-lamps which will be used in the States for the first time. They will be placed in the section of the grounds occupied by the State and Foreign Pavilions and on the concession streets. They will stand on a bronze upright, and will be attractive even when not lighted.

In the Court of Abundance gas will have its greatest part in the spectacular features of the earth, and the history of man in symbol will be presented. Here the high-pressure gas will be used in great flaring flambeaux surrounding the lagoon in the centre and lined against the fireproof walls of the Court. By the use of minerals distributed in the gas varied colours will be created, which will cast their spell on the splendour of the scene.

But important to the Exposition and to the scientific world as these uses of gas are to be, its use in heating promises to excel all others. "Surface Combustion" is something new in the scientific world, and has never been given extensive use; but if the plans of the Exposition are consummated, this development of the use of gas will be given a complete test which will advertise its merits to the world as no other means could do.

The advantages of the new system which the Exposition test would fully determine are: That the combustion is greatly accelerated by the incandescent surface, and may be concentrated just where the heat is desired; the combustion is perfect with a minimum excess of air; high temperatures are possible without the aid of elaborate regenerative devices; and as a matter of economy the originators claim for it twice the heat with half the cost.

If the Exposition agrees to instal this latest device for utilizing heat from gas, it will mean that every stove on the concession ground, the heating for the buildings—except possibly the service building—and all the cooking will be done by this radiant heat of surface combustion.

The Exposition gas expert is now preparing a design of heater which will be used with the idea of surface combustion in case it is ultimately agreed upon. Instead of requiring expensive apparatus for the various concessionaires, he will have hundreds of stoves built which will have a very nominal cost; and if these are not purchased, he will make contracts on behalf of the Exposition whereby they are to be rented to concessionaires at a very moderate charge. Here will be another utility which will be in the nature of the most interesting exhibit to the gas men of the world, and especially to the scientists who first conceived the idea of surface combustion.

The radiant heaters will also be installed in the Palace of Fine Arts and the Festival Hall. The gas expert will embody his own ideas of heating in these devices, and will use what he calls "psychological heating." By the use of a polished background fashioned into a parabola, he will have the heat radiated from many parts of the halls, and a small amount will be sufficient, as tests in the now completed buildings have proved to him.

Experiments with stoves coloured to appear red hot have demonstrated to him that warmth is also a condition somewhat dependent on the mind; and by his parabola the appearance of the heat glow will be many times enlarged, and the radiant heat when within range will be enhanced. By his type of commercial radiant heater the heat waves may be directed in any manner desired. All will be built some distance off the floor, and may be even suspended from the ceilings or walls wherever they will serve the greatest number of persons.

In the heaters to be used for cooking, there will be one great difference from all the stoves hitherto designed to utilize the principle of surface combustion. The Exposition stove will not have the fan, as the mixing of the gas will be accomplished without its use, due to a later idea. The operation will not only serve in the capacity of retailer of gas with exceptional advantages and conveniences in its use, but will also try to encourage and demonstrate the practical uses of surface combustion.

Gas will also be used for patrol purposes; and the grounds will be so well-equipped with gas lighting that a complete suspension of electric power would still leave the grounds well lighted. After the closing hours every day for the ten months gas will be used until daybreak.

These are the things that the Exposition will do with gas and the science that has been brought from the ends of the world to get the most out of its power. The many exhibits in the great Exposition palaces relating to manufacture, and the various appliances for gas consumption, will add to the interest of the world's greatest show to gasmen.

Gas as an Industrial Fuel in America.

A meeting was held at the headquarters of the American Commercial Gas Association on the 2nd inst., under the presideney of Mr. H. O. Loebell, at which he stated that at the mid-year conference of the Association to be held in New York in June, the industrial use of gas would be a prominent feature; and in the course of the discussion, it was decided to give this side of the gas business the widest possible representation. Certain members will each prepare a paper on some of the industries in which gas is employed; and it was agreed that it should be of an educative character, so as to be of value not only to the gas industry at large, but especially to the sales and new business departments of companies. The subjects to be dealt with will comprise the treatment of high-speed steel with gas, the hat industry, japanning, die casting, railroad shops, and the jewellery industry and automobile industries. The Chairman stated that the programme of the conference will include an exhibit of special appliances, the manufacturing processes, the advertising of gas as an industrial fuel, and a demonstration of all manufacturers' appliances on the market.

WATER SUPPLY IN RURAL DISTRICTS.

At a recent meeting in Birmingham of the West Midland District Division of the Institution of Municipal and County Engineers, Mr. H. J. Coleby, the Engineer and Surveyor of the Atherstone Rural District Council, read a paper entitled "Some Notes on Water Supply in the Rural District of Atherstone." The following are the principal portions of the paper.

Sources of Supply.

The rural district of Atherstone is roughly 25,000 acres in area, and has a population of about 18,000. It is divided into eleven parishes (of which the town of Atherstone forms one), which, for purposes of water supply, are grouped into four areas.

No. 1 area is supplied from a well which was sunk in the year 1882, in what was then called the permian, but which is now said to be part of the carboniferous, formation. The well is 9 feet in diameter, 70 feet deep, and for the first 30 feet from the surface is lined with brickwork in cement, in order to exclude all surface water. Below this point the well has been excavated in the red sandstone, which here is very hard and calcareous. At the bottom of the well a 12-inch borehole was sunk; but as this was found to have been filled up with clay, presumably no benefit by way of increased yield was derived. The machinery consists of two sets of double-barrelled single-acting bucket pumps of the stand-pipe pattern, fixed in the well, and driven by horizontal steam-engines—steam being supplied by two Cornish boilers.

When first sunk, this well yielded 300,000 gallons per day on the test pumping, and for some years a constant supply of about 100,000 gallons per day was obtained from it. The yield, however, gradually decreased, until at the present time the average quantity obtained is only 55,000 gallons per day, while it has sunk as low as 25,000 gallons. The author regards this as an indication that the underground reservoir of water has been exhausted by continuous pumping, and that the amount which can now be obtained is governed entirely by the rainfall and the area of outcrop. The latter is very difficult to determine—the site being near to the eastern boundary of the Warwickshire coalfield, and the ground being very much faulted. The recent investigations of the Geological Survey Department tend to show that, so far from there being a large and continuous area of water-bearing rocks, they are so divided by beds of impervious marls, and broken by faults, that the actual watershed drained by this well is very limited in extent, and is probably confined to the immediate vicinity of the well itself. This source of supply must therefore be regarded as a failure; and the author mentions it in order to point out the very capricious character of this formation from a water-supply point of view.

As a further instance of this, but of a more fortunate character, it may be mentioned that in 1887 a boring only 5 inches in diameter was made to a depth of 60 feet in the so-called permian formation at another part of the district, for the supply of No. 2 area, and this has yielded an average of 50,000 gallons per day ever since. In 1906 the author made a test of this boring by pumping day and night for a week with all the power then at his command; and he was able to obtain 104,000 gallons per 24 hours without materially lowering the water-level. This level, when pumping, is about 15 feet below the surface, and in this case two sets of horizontal treble-plunger pumps, driven by belts from Hornsby oil-engines of 16 and 22 B.H.P. respectively, are used.

The water for supplying No. 3 area is purchased from a colliery company, under an agreement, by which the company agreed to sink a well in the coal measures sandstone, to put down the necessary machinery, build a service reservoir, and deliver water into the council's mains at a cost of 6d. per 1000 gallons; the council undertaking to pay for a minimum quantity of 60,000 gallons per day. The distributing mains were laid by the council; and the scheme came into operation soon after the author's appointment, in 1902. After a short time, considerable trouble was experienced by reason of a large amount of reddish-yellow deposit which was found to be taking place in the mains. Upon investigation the water was found to contain iron, held in solution by carbonic acid. In its passage through the service reservoir and mains, it became sufficiently aërated to oxidize the iron, which was then precipitated as iron oxide in the mains, more particularly in those parts of the system where very little flow took place, and where the whole of the water was not changed very frequently. To remedy this state of affairs, the author, in conjunction with Mr. H. J. Clarson, of Tamworth, advised the adoption of Candy filters; and two of these, of the "pressure" type, were fixed upon the pumping main. They have proved effectual in oxidizing and removing the whole of the iron.

The author is, however, of opinion that permanent injury has been done to the mains by passing through them water charged with iron, since an examination of sections cut from different mains shows that the bituminous coating has been almost entirely removed from the inside, leaving the metal bare. It has been suggested that this may be due to the action of the iron bacterium (*crenothrix*). But as analyses of the water show it to contain very little or no organic matter, the author is inclined to think that it is due to the action of the liberated carbonic acid, and he would like to hear the opinion of any member who has had a similar experience.

No. 4 area is supplied from a boring 170 feet in depth, in the cambrian rocks. The yield, however, is very small; and it is proposed to augment this from another source in the near future.

Distribution.

Water is distributed over the greater portion of the district from three service reservoirs, through upwards of 45 miles of mains. The reservoirs are placed so as to command the whole of the areas in which they are situated, and are conveniently near the chief centres of population. The mains have been carried through nearly every road in the areas supplied; and out of the eleven parishes which comprise the rural district nine have water-mains in almost every road or street, and the remaining two are partially supplied. So that, as a whole, the district is well served so far as the leading mains are concerned. In some of the country parishes, indeed, long lengths of mains have been laid which only supply a few scattered farmhouses and cottages, from which very little revenue is derived by way of water-rate. In these parishes the repayment of the loans must be a heavy burden on the rates for years to come; while the mains, radiating as they do from the reservoir to the extreme boundaries of the parishes, cannot be made to form circuits, and so come to objectionable "dead-ends."

The author would submit this point as one for discussion—viz., whether, in designing a scheme for a country district, it is good policy to provide for mains reaching to every part of every parish for supplying a few scattered houses, where there is already, or where can be obtained, a good supply from wells on the premises. In such a case it seems to the author that the only excuse for burdening a parish with a thirty years' loan is that the water-mains afford protection in case of fire. But it is also his experience that these country parishes have no means for making use of a fire hydrant, and would have to await the arrival of a fire brigade from the nearest town, by which time the house might be burnt to the ground.

Faults in the Distribution Systems.

In one part of the district a service reservoir is supplied from another reservoir about 1½ miles distant, with only a small difference in level. The main connecting the two reservoirs was laid to follow the contour of the ground, and though it just comes below the hydraulic gradient, considerable trouble is experienced from "air-locking" at the highest points. The author has reason to believe that when this main was designed the head taken for discharge was that due to the difference between the top water-level in the upper reservoir and the floor-level in the lower reservoir. The result is that if the water-level in the upper reservoir falls, and the lower reservoir is nearly full, the head is so reduced that the main only discharges about 50 per cent. of the amount for which it was designed; while the high points in the main rise above the hydraulic gradient, and the air-locking eventually becomes bad enough to almost stop the flow. Of course, air-valves were fixed at all the high points; but, under the peculiar circumstances, they were found to be of very little use. In fact, under certain conditions, they were the means of admitting air to the main. As a remedy, the author has advised his council either to relay the main to proper gradients, or, since the upper reservoir is fed direct from the pumps, erect a stand-pipe on the pumping main, and place the main in question under the stand-pipe head.

Sizes of Distributing Mains.

Owing to mistaken ideas of economy in the past, the distributing mains in several parts of the district are much too small; and though the static head in some parts reaches 300 feet, the loss of head is such that very little more than 20 lbs. per square inch working pressure is available, and when any extra demand is made upon the larger supply-mains, little or no water can be obtained from the small service-mains. As an instance, the author tested some fire hydrants fixed on a 2-inch main 230 yards long, and found that though the static head was 220 feet, the working head, when discharging 40 gallons per minute, was reduced to 40 feet, or a loss of 180 feet head. In another case, with a static head of 140 feet, no pressure at all could be obtained, and the fire-hydrant was useless. A 3-inch main was substituted for the 2-inch in this case, with the result that the loss of head was reduced to 40 feet, leaving 100 feet available for working. It is the author's intention to carry out a series of tests of the capacities of all the fire hydrants in his district, and he would be glad to learn whether any member has used Prentice's hydrant flow-gauge for this purpose, and whether it has been found a reliable means of testing the discharge from hydrants.

New Boring.

It has already been stated that the Atherstone district is fairly well served, in that the mains penetrate to nearly every part of it. But, unfortunately, the supply of water in some places is very variable, and during the dry years of 1911 and 1913 there was considerable shortage. As the population of the district increased and is still increasing rapidly, it became necessary to seek some further supply of water to meet both present and future needs. On the advice of Dr. Herbert Lapworth, it was decided to make a boring in the bunter beds, which outcrop over a fairly large area in the northern part of the district. This boring was completed in May last to a depth of 300 feet, and, on being tested, yielded 240,000 gallons per 24 hours for fourteen days. This, however, must not be taken as the maximum yield, but was the limit of the capacity of the pump employed. At a depth of 160 feet a bed of soft white sandstone, coarse-grained, and containing

some small pebbles, was met with. This gave some trouble during the test pumping, and it was decided to line the portion of the borehole between 160 and 240 feet with steel tubes. The boring is 20 inches diameter, and the lining-tubes will be 18 inches internal diameter, with ordinary screwed and socketed joints. If any trouble is experienced from sand washing in after the tubes have been fixed, it has been suggested that an air-lift should be used instead of the ordinary borehole pump for raising the water to the surface. The author would be glad to hear the experiences of any member who has made use of air-lift plant under similar circumstances.

DISCUSSION.

Mr. H. J. Clarson (Tamworth) proposed a vote of thanks to Mr. Coleby for his paper. With regard to the Candy filters, so far as he could judge, they had been a great success. They had been down in his case a little more than twelve months, and up to now they had done the duty expected of them. He could not speak too highly of them.

Mr. E. B. Savage (Birmingham) asked Mr. Coleby to state the degree of hardness of the water, as the question was a very interesting one to Birmingham at the present time. One of the principal points suggested for discussion was whether, in designing a water scheme for a country district, it was good policy to provide for mains reaching to every part of a parish for supplying a few scattered houses, where there was already, or where there could be obtained, a good supply from wells on the premises. He should have thought, taking it all round, that the wells in country districts, if sunk to a proper depth, would yield a sufficiently good supply. Mr. Coleby had also asked for any experience in the use of an air-lift. The only place he knew in Birmingham where one was in use was at the Metropolitan works at Saltley; and, so far as he could see, it was very simple and very effective.

Mr. W. B. Chancellor (Lichfield) said, with regard to providing water-mains for scattered houses, if wells were sunk sufficiently deep, they ought to be quite satisfactory.

Mr. J. S. King (Birmingham) pointed out that when they had a house with a pigstye at the rear, and the well close by was not properly protected, it was very likely there would be pollution; and he thought it would be advisable, where they possibly could do so, to provide mains and supply water.

Mr. A. S. Parsons (Birmingham) said he noticed that it was proposed to line the 20-inch borehole with 18-inch tubes; and if it was intended to blanket the sand, it would be well to get the lining as tight as possible, or otherwise a good deal of sand would get into the pumps. As to air-lift plants, Mr. Savage was not correct in saying there was only one in Birmingham. He had put in two himself, and he should say there were a dozen others. An air-lift plant was an uneconomical way of raising water; the maximum efficiency being only 30 to 35 per cent.

Mr. F. C. Cook (Nuneaton) said the whole of the water supply at Nuneaton was obtained from wells sunk in the permian formation, which had not been regarded as rich in water. They had a very curious experience of what Mr. Coleby called the "capricious character" of the yield of the water-bearing rocks of this description. Their first well was taken down to a depth of more than 600 feet; but it was now yielding only 80,000 gallons. This had been the maximum yield. On the other hand, a well sunk in the same measures, nearer the outcrop, to 320 feet in depth, was yielding from 600,000 to 700,000 gallons. One curious point in connection with the water from these two wells was that at the deep well they were not troubled with oxide of iron, but they had it in a considerable degree in the second and shallower well. It was dealt with by sand filters, put down twelve or fifteen years ago; and they had very little evidence of the deleterious effect on the coating of the pipes.

Mr. W. Plant (Stafford) asked Mr. Coleby whether he had many complaints as to "dead-ends," as he (Mr. Plant) was constantly getting them. With regard to the supply of the whole of the houses in scattered districts, assuming they had already a supply of well water, he should say it was not desirable to extend under such conditions. The paragraph in the paper with reference to the connecting main between two service reservoirs was very interesting. It occurred to him whether it would not be useful to keep the main constantly charged to prevent it getting air-locked.

Mr. T. S. Griffin (Wolverhampton), speaking of the water supply of farmhouses in country districts, said in the district where he was prior to his present employment they had three water schemes; but there was a good deal of the district to which it was impossible to take the water under pressure, except at considerable expense. They had to supply a small hamlet of 22 houses, for which there was not a good well. A borehole was sunk about 350 feet, a pump was fixed there, and a good supply obtained. The nearest main to the houses was 5½ miles away. Mr. Coleby had mentioned that the water had attacked the mains in his district, and caused trouble; but in a case like the one of which he had spoken, where they would have to convey the water a long distance, and allow it to lie in the mains, it would cause even greater trouble.

Mr. R. Fletcher (Wolverhampton) said that Mr. Coleby had told them that a colliery company supplied him with water in bulk at 6d. per 1000 gallons. Perhaps he would tell them the cost per 1000 gallons of the water he pumped, so that they might see how it compared with the cost of the other water.

Mr. E. J. Goodacre (Nuneaton) inquired as to the relative position of the wells in No. 1 and No. 2 areas, considering the success of the one and the failure of the other.

Mr. J. D. Barrs (Bromyard) asked Mr. Coleby how he explained the faults in the distribution system. His statements in the paper seemed to be incompatible.

Mr. G. W. Lacey (Oswestry), referring to the subject of air-locking, said some five years ago he laid a main for a subsidiary supply, with only 10 degrees of fall between the intake and the delivery, Though he went down 8 or 9 feet in the lowest point, he was bound to keep the main about 2 feet above the hydraulic gradient. Notwithstanding this, he had difficulty in starting the main with air-locks, and a very long time was taken to suppress all the air from the highest points. Even with large air-valves, the air leaked back, and moved very slowly where they had a main discharging under a low head. As to the Prentice hydrant flow-gauge, he believed it was a reliable means of gauging pressure in the mains.

The Chairman said there were two ways of looking at the question of a water supply for a rural district. The medical officer of health was busy in rural parishes. He looked round and said there was not a proper supply, and the water was contaminated; and he advised the authorities to take steps to introduce a public supply. The question of cost then came in. If they could find wells, and keep them free from surface contamination, all would be right; but this was more difficult than it seemed. The wells were sunk in close proximity to offensive matters, manure-pits, and so on; and it was most difficult to exclude contaminating substances from the water. With regard to the long lines of main radiating from a centre, it was foolish to put in a 2-inch main to distribute water a considerable distance from the source. It was ridiculous to expect to get from such a main any pressure to combat a conflagration. The first cost must be considered; but it would be far better to put in a 3-inch main. Then it would be an easy matter to have a hose-reel and hydrant in a village, and so get the full benefit of the water running out to isolated hamlets.

The vote of thanks having been adopted,

Mr. Coleby, replying upon the discussion, said Mr. Savage had asked as to the hardness of the water. For one-half of the water it was about 26°. In the other part of the district, in which they had just sunk the new borehole, they had got from the first samples 18°. But when they had excluded a portion of the water, they expected the hardness to fall to 15°. Mr. Parsons asked why the tubes in the borehole were to be 18 inches diameter while the borehole itself was 20 inches. The 18 inches was the size of the interior of the tubes, which were 5-16ths of an inch thick, and externally socketed, which would bring the outside diameter up to the size of the borehole within ¼ inch. Then it was proposed to cement the tubes. The sand was very fine, and found its way through almost any perforation. He was glad to hear from Mr. Cook that the water did not affect the pipes in his district. He (Mr. Coleby) was not sure whether in his case some of the trouble was not due to the improper coating of the pipes. In answer to Mr. Plant, there were complaints from people who lived at the "dead-ends." The pipes were being constantly flushed. While the water charged with iron was going through, there were more complaints. Mr. Plant suggested that the mains should be kept constantly charged to prevent air-locking. Since the Candy filters had been installed, the trouble from air-locking had been greater than usual. It occurred to him that the oxidation being done by compressed air would have the effect of charging the water with air; and this would account for some of the trouble in the mains. He had not found air-valves which would act in both directions satisfactorily. Mr. Fletcher inquired the cost of water pumped in comparison with that bought; but he was not able to give it. He was asked as to the reason for difference in yield between the wells in No. 1 and No. 2 areas. They were in the same formation—the permian. No. 1 was in the part of the formation which lay immediately over the top of the coalfield; while No. 2 was situated on an outlier on the boundary side of the Warwickshire coalfield. Why there should be such a good supply from No. 2 well while there was a failure in No. 1, he could not tell; but he should say that the water had been depleted by colliery workings. The hydrant was tested under real working conditions, as if there were a fire. As to the size of the mains, they were laid thirty years ago; and he did not suppose the Local Government Board would sanction a loan for 2-inch mains now. He had heard that when the subject was first introduced, a consulting engineer prepared a very efficient scheme, with nothing less than 4-inch mains; but the cost was so great that the council would not hear of it. Someone else came along and said he could do the job for half the amount; and so 2-inch mains were laid throughout the district.

At a recent meeting of the Society of Public Analysts, Messrs. R. R. Tatlock and R. T. Thomson dealt with the question of the damage caused to vegetation by sulphurous and sulphuric acid in the atmosphere. According to them, the mere fact of the presence of sulphates in plants in excess of the proportion found in vegetation grown in a pure atmosphere is no proof of damage by sulphur acids. This is shown by results of analysis of plants from various localities; and the authors conclude that such damage can only be proved if (1) the percentage of sulphur dioxide is considerably above that present in the plant normally, and (2) the leaf or other part of the plant, when moistened on the surface with water, gives an acid reaction with litmus, phenolphthalein not being admissible.

AN EXPERIMENT IN IMPROVED STREET LIGHTING.

In the course of a paper, on "Gas Street Lighting," read by Mr. F. Victor Westermaier, of Philadelphia (Pa.), before the members of the Illinois Gas Association at their last annual meeting, he remarked that the use of gas for street lighting, in units of higher candle power than the standard lamp, has not been extended in America because of the lack of encouragement on the part of gas companies and municipalities. He said that if gas is to continue as a competitor of electricity for street lighting, gas rates will have to be made to conform with electric rates for the same purpose, in order that the increased efficiencies by larger gas consumptions can be obtained. He gave the following particulars of an attempt to show the possibilities of gas for street lighting.

For the purpose of demonstrating what could be done with lamps of higher candle power than standard lamps, a series of tests was made on a thoroughfare representative of average gas street lighting. The results are interesting, inasmuch as they demonstrate the possibilities of gas street lighting at moderately increased rates of gas consumption. In making the tests, special lamps were designed capable of using both upright and inverted mantles singly and in clusters. For getting the effect of different elevations above the street surface, portable posts were used, adjustable as to height, and substantially supported. These were spaced along the street, opposite the lamps in service. The gas for the tests was supplied through a 2-inch wrought-iron pipe laid along the kerb, on each side of the street, and in connection with the main through a meter. The street was 800 feet long, 30 feet wide from kerb to kerb, and lighted by eight standard lamps. Horizontal illumination measurements were made at equally spaced testing-stations along the centre of the street, at an elevation of 3 feet. As these tests were to be comparative, the same spacing of lamps and test stations was used throughout. After the test, lamps were mounted on the posts and lighted, the regular lamps were extinguished, and the mounting height of the lamps raised until the measurements indicated a fair degree of uniformity. After fixing the height of the lamps, the illumination measurements were taken, and the values of the proposed units compared with those obtained with the regular lamps; the basis of comparison being minimum and average illumination values, and the ratio of maximum to minimum illumination.

It was found that the most uniform lighting results were obtained with the upright mantle units, though by using glass of special manufacture, and frosted, excellent diffusive effects were produced with the inverted mantle units. With clear glass globes, the latter lamps had a tendency to produce a spotted effect; the maximum flux of light in these tending more towards the vertical. This lamp, when mounted 13 ft. 2 in. above the street, gave excellent results with a consumption of gas at the rate of 5 cubic feet per hour. The effect of the reflector was obtained at an increased elevation over the regular post height of 3 ft. 8 in. When at the regular height, the intensity of light about the post was increased; but the minimum value between lamps was not materially greater than that obtained with the regular lamps—showing the effect of elevation. The ratio of maximum to minimum illumination, along the centre of the street, with this lamp was 2·21, as compared with 2·99 with the regular lamps—a somewhat higher degree of uniform lighting. The minimum illumination along the street was raised from 0·0128 foot-candle to 0·0323 foot-candle—a gain of 152 per cent., and an increased general average illumination of 107 per cent., effected by an increased gas consumption of only 42·8 per cent. Double upright mantle units at a mounting height of 13 ft. 8 in. raised the minimum illumination by 274·2 per cent., and the general average illumination by 295·5 per cent., with an increase of 100 per cent. in the consumption of gas.

Several single and multiple inverted mantle outfits were tried with satisfactory results; the best consisting of four inverted mantles, consuming gas at the rate of 11·50 cubic feet per hour. With the lower part of the globe frosted, much of the downward flux of light was diffused; assisting the general effect, and eliminating bright spots around the post. Even better results were produced with a crystal glass globe, over which was flashed a light film of alabaster, and frosted on the outside up to within 7½ inches of the top. The absorption of light by this globe was 18 per cent. greater than with the plain glass globe; but the illuminating effect gained more than compensated for this loss, by breaking-up the glaring effect of the clear glass, increasing the diffusion of light over the entire globe surface, and eliminating specular reflection. In comparison with the regular lamps, these units, with clouded alabaster globes, and mounted 15 ft. 2 in. above the street level, and at equal spacing apart, raised the minimum illumination 694·5 per cent., and the general average illumination 559 per cent.—the ratio of maximum to minimum illumination values being 2·63, compared with 2·99 with the regular lamps. This large increase in street illumination was produced by an extra consumption of 8 cubic feet per hour, or about 288 per cent. A decided ornamental effect was brought about with this unit by using a totally diffusing globe of "Polycase" glass. Though the general average illumination was not so high as with the clouded globes, because of the greater absorption of light, the uniformity of illumination was well maintained. The density of this glass was great enough to obscure the light source—the entire globe being illuminated. For exclusive and restricted section lighting, no more beautiful unit than this could be used.

The foregoing tests demonstrated that, with an increased gas consumption, marked advantages in lighting effects could be produced, not only in greater illumination, but in raising the dignity of gas as a street illuminant. To make use of these new units, posts of proper height and of appropriate design are necessary. This was an item of expense which the city was not in a position to bear; consequently the advantages of improved gas lighting, as demonstrated, could not be procured. Had the posts been supplied, as is done by the Electric Light Company when new units are installed, it is very probable that increased lighting business would have been obtained. Interest was aroused, however, by these demonstrations, to the extent of calling for further tests to determine what results could be obtained by using the existing lamp-posts, and increasing the gas consumption. This was a problem requiring careful consideration, in view of the limited mounting height and the necessity of maintaining a high degree of uniformity. The simplest solution would have been to increase the gas consumption in the existing lamps; but as it was desired to obtain the maximum efficiency possible with a minimum increase in gas consumption, a fixture, finally considered to be the most practical, was made with two inverted mantles mounted high in the regular lamp, and having directly beneath them a flat enamel reflector. With an increase of 2 cubic feet of gas per hour per post, the minimum and average illumination values were raised 258 and 282 per cent. respectively; the ratio of maximum to minimum illumination values being 3·49, compared with the standard of 2·99 with the regular lamps—not quite so uniform in illuminating effect, but nevertheless satisfactory, considering the fixed mounting height.

The intrinsic brilliancy of this unit, in a clear glass globe, was somewhat higher than that of the upright mantle; and for this reason the effect of glare was more noticeable. To overcome this objection, a special globe was made, and, as in the case of the four-mantle unit described, very gratifying results were obtained. The clear glass globe was flashed with a light coating of alabaster, the frosting carried up to a point which would reduce the high degree of illumination directly around the post, and project the maximum rays the greatest distance. The effect of this change was remarkable, inasmuch as not only was the disturbing element of glare very greatly reduced, but a generally better illuminating effect was obtained by reason of the change made in the distribution of light. These units, mounted on the same posts as the regular lamps, hold substantially the same degree of uniformity of illumination, but increasing the minimum illumination value 235 per cent., and the average 266 per cent., with an increased gas consumption of 57 per cent. over the regular lamps. With posts a few feet higher, even greater results would have been obtained.

MACHINE DIGGING v. HAND DIGGING FOR PIPE-TRENCHES.

This was the subject of a paper submitted by Mr. C. B. Strohn, the Engineer of the Western United Gas and Electric Company, at the recent annual meeting of the Illinois Gas Association in Chicago. He brought out the fact that trenching by machine costs less than by any other method of doing the work.

The author said he believed that prior to the year 1910 gas men did not consider machine trenching to be either practicable or economical. Those who constructed pipe-lines thought the uneven surfaces of the ground would be inimical to the use of mechanical appliances. The manufacturers and contractors owning these machines were, however, made acquainted with the objections raised to them, and they gradually overcame them. He gave an instance of a pipe-line extending 8½ miles along a road lined on either side by numerous steep banks. It was stated by one who was competent to express an opinion on the matter that only 66 per cent. of the distance could be dug by a machine; but when the job was finished it was shown that more than 95 per cent. had been excavated. Mr. Strohn, after giving particulars of some of the machines upon the market, described as follows the

Method of Operation.

After the machine arrives from the manufacturer, the brakes on the flat car are set, and the car wheels are carefully blocked. At the rear end a runway is built of railroad ties and long 8 in. by 12 in. timbers. The motor is then started, and the machine is lowered from the car. It travels by its own power to the point where the digging is to be done. If the ground is not perfectly level, blocking should be provided. The best blocking is hardwood planks about 6 feet long, 12 inches wide—some 2 and some 3 inches thick. If there is considerable incline to the surface, it is necessary to use some pieces 6 inches and some 8 inches square. When the incline is so great that this blocking cannot be used with safety, the surface in front of the machine should be shaved off with a plough, and either levelled by hand or by the ordinary road grader which the layers of pipe-lines use for filling trenches. One man should be placed behind the machine, and one (or two men, if necessary) ahead, to attend to the blocking, if this is needed. The man behind is supposed to do two things. One is to watch the contents of every bucket, and, if he sees a large rock, signal

to the operator, who stops the excavator at once for the purpose of removing the rock; otherwise it would damage the buckets, chains, sprockets, cleaner arms, &c. The other duty is to shovel into the ditch the small ridge of dirt left on the side opposite the one on which the conveyor deposits most of the spoil. This small ridge is usually only 6 inches high; but it interferes with the work of the pipe men later on, especially if the pipe is screwed together above ground. A good operator will detect any hard substance, and stop his machine immediately if a large boulder is struck by the bucket teeth. In this case he raises the excavator slightly, and passes over the obstruction, whatever it may be. A person who has not seen a trenching-machine operated might be of opinion that it must necessarily proceed in a straight line at all times. But this is not the case. A good operator will pass round a rather sharp curve without damaging his machine.

Cost of Working.

During the season beginning April 1, 1913, and ending Feb. 1 1914, the Company with which the author is connected operated three Austin No. 00 machines. The total number of feet dug was 362,960, or 68·7 miles. The cost of operating every machine was kept separately. The following figures [taken from tables in the paper] show the cost: For 8-inch pipe, $2412; for 4-inch pipe and less, $7882·48—total, $10,294·48. The following is the cost per foot: All sizes of pipe, 2·84 c.; 8-inch pipe, 3·83 c.; 4-inch pipe and less, 2·62 c. The total number of cubic yards dug was 76,203·3; and the cost per cubic yard was 13·5 c. These are average figures based on the assumption that the cost of removing one cubic yard of earth from a trench 23 in. by 48 in. is the same as for one 18 in. by 42 in. There is no filling cost shown in the tables, as it costs almost the same to fill a ditch regardless of the manner in which the earth is thrown out. The machine throws it probably 12 inches farther away from the edge of the ditch than does hand trenching. This condition does not increase the cost of filling to any great extent, when the filling is done with plough and road grader. [The writer incorporated in his paper replies to letters addressed to every gas company in the country, asking for information as to their success or otherwise in the use of trenching machines; and the preponderance of sentiment favoured the machine.]

I found that very few gas companies could give accurate figures on the cost of hand digging; but enough information was received to allow the conclusion that, for the same kind of work on which the Western United Gas and Electric Company used machines, hand digging would have cost not less than 7 c. per foot. It is estimated that on this work there has been a saving of 4 c. per foot, and in some soils a greater saving.

Advantages and Disadvantages of Machine Trenching.

The following are given by the author as the advantages of machine trenching: Smaller pay roll, less labour trouble, less work for paymasters, fewer men for foremen to watch, and more simple organization. If the paymaster is robbed, less money is lost; and the system is less expensive because no head-end plough gang is needed. If necessary, a machine can work night and day, and during noon hours. If the ditching gets too far ahead of the pipe work, the former may be discontinued until the latter catches up. With a gang of hand diggers, this could not be done, because they would go elsewhere if not allowed to work steadily.

The disadvantages of the system are these: In some places the roadside is too slanting to permit machine trenching, while in others the ground is so soft that a machine would become mired. In certain places too much rock damages the machine to such an extent that the cost of operating is prohibitive. If a machine is in use too far from the place where it is manufactured, breakage causes too much delay in procuring repairs. In localities where numerous gas and water services, telephone conduits, and sewer-pipes are encountered, the damage to them is sometimes great; and the time and labour lost in endeavouring to prevent this damage is considerable. The operation of a trenching-machine is more practical in the country, where there is no danger of creating this damage.

Conclusions.

The length of a job which would justify the purchase of a trenching-machine is about 15 miles. This would mean a saving of $3168 over hand trenching, assuming that the saving is 4 c. per foot. A machine costing $5000 could probably be sold for $2500 at the end of that time. Therefore $2500 *plus* the amount saved would be $5668. It is safe to conclude that a machine would not be practicable in cities where the streets are filled with gas, water, and sewer pipes, telephone conduits, &c. Trenches dug mechanically are profitable only where machines can be operated without interruption caused by damage, obstructions, unfavourable soil, irregular surfaces, and short jobs. Therefore the companies contemplating the construction of country pipe-lines would do well to investigate the subject thoroughly.

Iron and Steel Institute.—The annual meeting of the Institute will be held in the new building of the Institution of Civil Engineers, Great George Street, Westminster, on the 7th and 8th prox. The President for the ensuing year is Mr. Adolphe Greiner. Among the papers to be submitted to the members is one by Herr F. Müller, on "The Development of Dry Cleaning in Blast-Furnace Gas Purification."

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Annual General Meeting.

The Annual General Meeting of the Western District Division of the Scottish Junior Gas Association was held in the Royal Technical College, Glasgow, on the 11th inst.—Mr. John Wilson, the President, in the chair.

Report of the Council.

The Council's report, which was adopted, indicated a strenuous and most successful session. There were on the roll 182 ordinary and 22 honorary members, and two patrons; the increase in the ordinary members over last session being 26. During the year an effort was made to increase the number of representatives of coke-oven plant; and in this direction they secured four new members. The medal for the best paper read during the session, presented by Mr. James M'Leod, of Greenock, had been allotted to Mr. G. F. M'Killop (Broxburn), for his paper on "The Vertical Retort of the Shale Oil Industry;" and Mr. T. Carmichael (Dalmarnock) carried off the second prize, the value of which had been enhanced by Mr. F. L. MacLaren, of Dumbarton. The Council congratulated the following gentlemen on their promotion: Mr. John Frazer (President of the Association 1910-11), to be Manager of the Dalmarnock Gas-Works; Mr. E. Allison (Airdrie), Assistant Engineer and Manager at Redhill, Surrey; Mr. John Ferns (Provan), foreman at the Johnstone Gas-Works; Mr. Thomas Moffat, of Tradeston, to be general foreman there; Mr. A. Stewart (Stirling), foreman at Airdrie; Mr. John Smart (Kelso), Assistant-Manager at Harwich; Mr. Charles Wilson (Greenock), Assistant Manager and Engineer at Aldershot. It was a matter for congratulation that the honour of reading a paper before the Institution of Gas Engineers had fallen to one of their members—Mr. G. T. Purves, of Auchengeich, Chryston.

Election of Office Bearers.

It was intimated that the Vice-President (Mr. Thomas Carmichael) became President for the ensuing year.

On the motion of Mr. John Frazer, it was agreed, with hearty unanimity, to appoint Mr. David Fulton, who was retiring from the position of Secretary and Treasurer, to the post of Vice-President. On a ballot being taken, the following were elected members of Council in place of those retiring: Messrs. T. Moffat (Tradeston), R. Barr (Kilmarnock), J. Dickson (Kirkintilloch), A. Paterson (Glasgow), and J. S. M'Nicol (Dawsholm). Mr. James Cubie (Glasgow) was appointed Secretary and Treasurer.

Lecture by Dr. Davidson.

At the conclusion of the business, a lecture was delivered by Dr. W. B. Davidson, of Birmingham, on "Tar and Liquor." It was given in the "Journal" last week (p. 109), and at its conclusion the lecturer added the following remarks:

It is quite feasible to make pitch direct from the gas. What happens is this: The tar left in the hydraulic main is continually agitated at its surface. The hot gases leaving the retorts come into the main at a temperature of about 440° Fahr.; and at this temperature it is not possible for anything but pitch to be present in the main. If you put in ordinary tar the light oils will be distilled; and given sufficient time and quantity—these things will require regulation—you get left after a number of hours nothing but pure pitch, which is perfectly liquid and very clean, and can be run off from time to time. I do not know what it is going to save the tar distillers; but I think it should save 6s. or 7s. per ton of tar, for you have to remember that two-thirds of the tar saved to the distiller is pitch. But he has to deal with this pitch, and provide large stills and extra heating; and he is troubled with free carbon. If you remove this pitch from the hydraulic mains—and it is possible to remove at least 90 per cent. of the total—it ought, as I have said, to be worth 6s. or 7s. a ton of tar for the labour. As in many places, we are handicapped in Birmingham, because both tar and liquor are sold to distillers. There is no very great incentive given to experiment. The tar can be worked to contain nothing but pitch, and run off after in a thin liquid. It runs very freely, and in this way a great deal can be saved in the cost of washing-up the tar. This pitch contains practically no ammonium chloride; the temperature being too high for this to deposit.

There was no discussion upon the lecture, but questions were invited.

Mr. J. W. Napier (Alloa) congratulated the Association on having obtained the services of so celebrated a scientist as Dr. Davidson. They were aware that the engineering side of their work had been too much emphasized; but he (Mr. Napier) ventured to say that before they could have perfect practice they must obtain principles. They looked to the scientist to discover these principles, which meant so much. Having regard to the large increase which had occurred with the introduction of vertical retorts, and also to Dr. Davidson's varied experience with both the horizontal and vertical types, it would be useful if he would tell the members what, in his opinion, was the increased value of raw tar in respect to the different constitution of the tar. They understood that in horizontal retorts this was different from the constitution of the tar produced in vertical retorts. Where they had tar produced from the distillation of coal in mass,

obviously it must be improved in quality. It would be interesting, from the commercial point of view, to know what, in Dr. Davidson's opinion, was the increased value per ton of tar from vertical as compared with horizontal retorts. It was clear Dr. Davidson was of opinion that the continuous intermittent vertical retort was not likely to give the same trouble as the purely continuous system. This was gratifying to those who had fitted in the continuous intermittent system. In introducing vertical retorts at Alloa, he had arranged to instal a Dillamore tar-column; and by this means he hoped to eliminate all possible troubles with tar, inasmuch as it would be immediately removed from the hydraulic main, which would be subsequently flushed to remove anything left of it.

Mr. JOHN FRAZER (Provan) asked for further information regarding the separation of the tar from the ammoniacal liquor. He also wished to know what means Dr. Davidson adopted to measure the quantities of each in actual practice.

Mr. D. VASS (Perth), said it had occurred to him that Dr. Davidson had struck a new note—the direct production of a distillate from the tar in the retort-house instead of treating it afterwards. In distilling the tar over again, they got about 86 per cent. of refined tar. In Dr. Davidson's manner he got 75 per cent. of the weight in his pitch. It came to be a question of being profitable at one time to make pitch and at another to make tar. Would it be possible to stop the distillation at a certain point, so as to produce refined tar suitable for road work, instead of carrying it so far for the pitch, thereby meeting a more open market for this residual?

Mr. H. O'CONNOR (Edinburgh) remarked, with reference to the test of the evaporation of the liquor standing in the open bath covered over, that Dr. Davidson said that at 50° Fahr. he found a loss of 1¾ per cent. He wondered if Dr. Davidson had tried this at higher temperatures, to see if it would be different.

Mr. W. WILSON (Falkirk) said there was one point which was not very clear to him—the question of the intermittent flushing of the hydraulic main with tar. Was he right in taking it that the statement referred to test plant? How could hydraulic mains be flushed in ordinary gas-works? Had Dr. Davidson made any arrangement for flushing intermittently upon a large retort?

Dr. DAVIDSON, replying to the questions, said Mr. Napier would like to know—and so would he, very much—the different value of tar from verticals and horizontals. He had heard of engineers having verticals demanding a higher price for their tar. He had been told that in Berlin they got 5s. a ton more; but he did not take it as gospel truth. He was not by any means an authority upon tar, but he would say about 10 per cent. more. Mr. Frazer had mentioned the trouble in separating and measuring. It was a very difficult matter, indeed. The great point was to let the liquor and tar remain long enough. On the test works, where they made the most careful tests, they used a rod wetted with paraffin to get a line of demarcation. Mr. Vass had inquired about the possibility of stopping the pitch at a point, and using it as road tar. When he struck upon the idea, he mentioned it to a tar expert, who said it was the very thing for road work, because it was possible to get the sort of tar that was wanted. Mr. O'Connor had very pertinently asked about the temperature required. He took 50° Fahr. as being the average. As the temperature increased, the rapidity of the evaporation was also much increased. They carried through the tests for months. They found a film of tar upon the liquor had a very important effect upon stopping the evaporation of the ammonia. The point Mr. Wilson had inquired about was not quite clear. They did not wish to seal the pipes at all; but, owing to the difficulty of cleaning them with the type of anti-dip he had arranged for, they got into trouble with stopped pipes. It was necessary with vertical retorts to keep the pipes clear. There was no difficulty if they did it regularly and at the proper time, when the tar in the pipe was soft.

On the motion of the PRESIDENT, a hearty vote of thanks was accorded to the lecturer.

Dr. DAVIDSON, in responding, said from what little he had seen of the gas industry, there was ample scope for the young and enterprising spirit. It was rather a pity that young men who were very capable got such poor salaries—at times no better than stokers' wages. But they must be patient; and if they showed the proper spirit, no doubt their efforts would be rewarded.

The meeting closed with a vote of congratulation to Mr. Purves on having secured the honour of reading a paper before the Institution of Gas Engineers in June.

Annual Dinner.

The most successful and important social function which the Association has held took place in the evening in Sloan's Café, Argyle Arcade, Glasgow, where the members and their guests assembled for their annual dinner. The PRESIDENT (Mr. John Wilson, of Falkirk) was in the chair, and those present included Dr. Davidson and Messrs. Alex. Wilson (Glasgow), Blair (Helensburgh), Bell (Kirkintilloch), Vass (Perth), O'Connor (Edinburgh), W. Wilson (Falkirk), T. Wilson (Coatbridge), Napier (Alloa), Waddell (Dunfermline), and M'Leod (Greenock).

The toast of "The Scottish Junior Gas Association (Western District)" was proposed by Councillor DRUMMOND, the Sub-Convener of the Glasgow Corporation Gas Committee; and he referred to the great encouragement which the founding of the Association had given.

The PRESIDENT, in acknowledging the toast, said their net was thrown wide, and they took in anyone who was actually engaged in the manufacture of gas or interested in it. In this he thought they were better than some of their English *confrères*. He then presented to Mr. M'Killop and Mr. Carmichael the prizes which had been announced at the annual meeting. He also referred to a matter of importance. Their honoured Secretary, Mr. David Fulton, was retiring, after carrying out his duties in the most painstaking and thorough manner. It had been a positive pleasure to work with Mr. Fulton. On behalf of the Association, he presented him with a gold albert chain, a set of books, and a suit-case.

Mr. FULTON, in returning thanks, alluded to the work of the Association, and threw out the suggestion that any surplus they had ought to be devoted to the formation of a library that would be easily accessible to the members. It was a matter in which they might get the help of the employers, for an increase in the knowledge of an employee was an asset to his employer.

In proposing the toast of the "Kindred Associations" Mr. T. CARMICHAEL remarked that their Associations, Junior and Senior, represented a membership of more than 3000; and they in Scotland, including juniors and seniors, represented one-fifth of the whole.

Mr. ALEX. WILSON, replying for the Senior Associations, said that he felt himself as much a junior as any of them; and he was going to try to remain one as long as possible, as in this way he thought he could do better for himself and for his department. Membership of the Junior Association undoubtedly made a man more valuable to his employers. Those men who worked most enthusiastically among the Juniors were always of the most assistance in his department. He thought the invitation to Mr. Purves to read a paper before the Institution of Gas Engineers was a very valuable thing. It would do the Junior Associations all over the country a world of good. It would set young men to look out fit subjects for papers, with a view to giving them before the seniors; and as they all could not give these papers to the Senior Association, the Junior Associations would benefit.

Mr. W. GEDDES (President of the Eastern District Division), who replied on behalf of the Junior Associations, said the Western District Division was doing excellent work, and the Eastern was following very closely in its footsteps. Unfortunately it seemed the tendency in the Eastern District for the seniors to leave them severely alone. He might state that a library had been an institution with them for some years, and during his period of secretaryship it had been greatly taken advantage of.

The toast of "Our Guests" was in the hands of Mr. LANGLANDS, who, referring to Dr. Davidson, said Birmingham was well off to have him. Birmingham was a school for young men on whom they in Scotland would need to keep an eye. He threw out the suggestion that the Eastern and Western Districts should "swop" papers and speakers, as it would be an incentive to criticism. He felt there would be a chance of pungency when the East was pitted against the West.

Dr. DAVIDSON, replying, said he would never be an Englishman though he had spent a good many years in England. But he thought possibly the Scotch were too clannish; the English were more magnanimous. They certainly treated them well in England. Many Scotsmen were to be found in England, and it was to the credit of the Englishmen that they did not seem to bear the Scotsmen a grudge. The English selected the best men they could find, regardless of nationality. He hoped the same spirit would prevail in Scotland. He advocated the writing of papers, as it made a young man get deep down into his subject.

The toast of "The Chairman" was proposed by Mr. JAMES M'LEOD (Greenock), and duly honoured.

SOME PROPERTIES OF BLAU GAS.

In a recent number of "Metallurgical and Chemical Engineering," Dr. Hugo Lieber dealt with the subject of the manufacture of Blau gas, to which reference has been made on several occasions in the "JOURNAL." This gas, as readers will be aware, is the result of an attempt by a German chemist, after whom it is named, to produce a transportable illuminant. In the first process employed by Blau, the gas was drawn from the holder in which it was stored into a cooler, where, under a suitable process, it was cooled considerably below zero, in order to liquefy and discard certain of the hydrocarbons not desired in the finished product—*i.e.*, such hydrocarbons as would again liquefy under normal pressure and temperature. Under the process employed in Blau gas factories at the present time, this preliminary cooling has been discarded. The gas is drawn directly from the holder into the compressor, which is usually a three or a four stage one; the liquefying and the discarding of the coercible hydrocarbons taking place in the first and second stage of the compressor, and the rest of the gas passing on into the third and eventually the fourth stage, where it is compressed to about 100 atmospheres. During all stages of the compression water is injected into the compressing chambers for lubricating and cooling purposes, and separated from the liquefied hydrocarbons after the last stage of compression. The tar obtained from the cooled and scrubbed gases is collected and sprayed under the retorts as fuel to supply the heat required.

In these processes some permanent gases have been produced which the liquefied hydrocarbons have been unable to absorb; and these are stored in large cylinders, from which, by means of proper reducing and regulating valves, they are conducted to the engine, where they produce all the power needed in the plant. The final product, consisting of liquefied hydrocarbons and non-liquefied hydrocarbons absorbed by them, is of such composition that the aggregate will remain liquid as long as it is under the pressure employed in the process, but will at once become converted into a gaseous aggregate if the pressure is reduced to approximately that of the atmosphere.

Under the compression of 100 atmospheres, the gas is reduced

to 1-400th of its volume, and has a specific gravity approximately the same as that of atmospheric air. Blau gas has a calorific value of about 1800 B.Th.U. per cubic foot. Its explosive range is lower than that of any other commercial illuminating gas, as shown by the following table:

	From	To	Explosive Range.
Coal gas	6·33 p. ct. gas. / 93·67 ,, air.	19·33 p. ct. gas. / 80·67 ,, air.	13 p. ct.
Acetylene	2 ,, gas. / 98 ,, air.	49 ,, gas. / 51 ,, air.	47 ,,
Hydrogen	9·5 ,, gas. / 90·5 ,, air.	66 3 ,, gas. / 33·7 ,, air.	56·8 ,,
Blau gas	4 ,, gas. / 96 ,, air.	8 ,, gas. / 92 ,, air.	4 ,,

As already stated, the heat value per cubic foot of Blau gas is about 1800 B.Th.U., whereas that of acetylene is 1500 B.Th.U., and of hydrogen 425 B.Th.U. As the volume of Blau gas is reduced to 1-400th by compression, it requires much smaller receptacles to transport a certain number of heat units in this gas than with any other. Acetylene may be considered a transportable gas; and the following table shows the heat value per cubic foot, the container capacity, the weight and the number of containers required, and the price per 100,000 B.Th.U.:

	Hydrogen.	Acetylene.	Blau Gas.
Heat value in B.Th.U.	425	1500	1800
Contents of a container of 1 cubic foot capacity	120 cub. ft.	100 cub. ft.	300 cub, ft.
Weight of containers required to transport a given number of heat units (for example 540,000)	1060 lbs.	432 lbs.	100 lbs.
Number of containers required to ship 5,400,000 B.Th.U.	106	36	10
Price for 100,000 B.Th. U.	$1·41	$1	44c.

Blau gas is transported in steel cylinders ranging in size (water capacity) from ¼ litre (0·44 pint) to about 100 litres (22 gallons). The size mostly used is a cylinder with a capacity of 27 litres, or about 1 cubic foot. This cylinder, when properly filled, contains about 20 lbs. of Blau gas, which will be converted into about 250 cubic feet of expanded gas when the pressure is released. As Blau gas does not contain any carbon monoxide, it is non-poisonous. It is used extensively for steel and cast-iron welding and cutting, brazing, soldering, and for laboratories, where a uniform gas, with a high calorific power, is essential. In districts where gas is not supplied through mains, Blau gas is used for illuminating, cooking, heating, and similar purposes. The cylinders are attached by means of a reducing-valve to a small expansion-tank; and from there the gas is conducted into the piping by a pressure regulator.

CARBURETTED AIR FOR TOWN LIGHTING.

Attempts have been made from time to time to replace coal gas by one obtained from liquid hydrocarbons. The matter is one of considerable importance, from the industrial standpoint, in places where coal is dear and petroleum and gasolene are abundant. It is also of interest in coal-producing countries, because the cost of manufacturing coal gas is relatively high, owing to the necessity for putting up expensive plant which is beyond the reach of many small towns. The production of carburetted air, on the other hand, does not require large and costly plant; and the only obstacle in the way of the adoption of this method of providing an illuminant for towns has been the apparently insurmountable technical difficulties met with. It is claimed, however, that these have been overcome by a system of production for which Herr C. H. E. Wetzels has taken out a French patent [No. 451,597]. Its nature is indicated in the following particulars translated from the specification.

The great difficulty in the way of the adoption of carburetted air for ordinary town lighting has been the instability of the mixture. In small domestic plant comprising an air compressor and carburetter, the gas can be consumed as it is produced, and the distance it has to travel from the plant to the burners is not great enough for decomposition to take place. When, however, it is a question of constructing plant of large dimensions, and distributing the gas for lighting purposes, it becomes necessary to provide, in addition to the producer, a gasholder, to meet the requirements due to fluctuations in consumption. In this holder the gas gets impoverished; afterwards condenses in the mains; and when it reaches the burners it is not rich enough to produce incandescence in a mantle. In face of the impossibility of conveying a sufficiently rich carburetted mixture to the burners, an arrangement was devised for replacing the air by a combustible gas like carbon monoxide, producer gas, or water gas. This method gives better results practically; but from an industrial point of view it is only of minor interest, as it is rather expensive.

The invention under notice consists in carburetting the air in immediate proximity to the appliances to be employed for its consumption, instead of doing so at the works. In other words, in place of having a combined air compressor and carburetter, with a separate burner, as hitherto, another arrangement has been adopted, consisting of a carburetter and burner connected with a separate air compressor. The advantages claimed for this arrangement are considerable. In the first place, as the gas is carburetted at the spot where it is consumed, there is no fear of decomposition. Fouling of the mains, owing to condensation, can only occur between the carburetters and the burners, and does not affect the general system of distribution. Leakage from the main only results in loss of compressed air, and not of combustible gas; and consequently the dangers of fire and explosion are avoided. Repair and fitting work is much easier to execute on a compressed air system than with gas-mains, because a blowpipe or other appliance with naked flame can be utilized without danger of accident. Air at high pressure can be utilized for the incandescent lighting of streets with the aid of powerful burners using atomized petroleum; and, by means of suitable reducing apparatus, it will enable private consumers to obtain light and heat from ordinary burners utilizing benzol or gasoline vapour. The distributing system can be utilized in the daytime for supplying power; and this will tend to economical working, as the plant can be kept running continuously.

In order to convey a better idea of the principle of the invention, an example is given, on a drawing attached to the specification, of its application for the distribution of light and power in a small town. The works, comprising the plant with one or more compressors and a gasholder, are located outside the town, and from the holder run pipes conveying compressed air to carburetting stations situated at different parts of the area of supply. These stations feed the public lamps, and the private houses which have been fitted with the necessary appliances. The arrangement of details will, of course, vary with the plan of the town to be supplied and the conditions of service.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Alliance and Dublin Gas Company.

SIR,—The shareholders should be grateful to you for your very complete report of the general meeting, and specially for the very enlightening statement of the Chairman, who after giving the number of slot installations stated their cost to have been £400,000—most of which (£230,000) had been written-down; leaving £170,000 standing. As most of this work has been done in the last ten years, this means that £23,000 a year—equal to 4d. per 1000 cubic feet tax on the gas—has been incurred beyond the heavy charges for wear and tear.

Your readers will appreciate this astounding revelation if they will look at their balance-sheets for 1913, in which £3320 at June and £3300 at December are shown to be written-down off capital; leaving a sum for the year of £40,883 charged as distribution costs. As, roughly, £6000 is 1d. per 1000 cubic feet, this shows a cost of 6¾d. per 1000 feet to compare with the 3½d. usually spent by Provincial companies and corporations as they appear in "Field's Analysis." Clearly, the management is here wasting £20,000 a year.

Speaking of "Field's Analysis," your readers who are familiar with this valuable text-book (which is always considered to be infallibly accurate) will be astonished to find that for six years past the figures given and analyzed do not represent the true figures of distribution expenditure of this Company (nor of income) by something like 2½d. per 1000 cubic feet. So that the working appears to compare less unfavourably than it should do with other undertakings. This may only be of interest to the shareholders who are technically versed; but it has proved a very sad and compromising pitfall to myself, as having, on the faith of it, misled many friends into investing in the Company, who now seek some justification at my hands, which frankly I am unable to give.

I naturally advised from "Field's Analysis" because the Company's accounts as published mixed up things which should be separated, both in the cost of materials and in the income from slots; so that it is impossible to get at the facts, as Mr. Dickens himself found when he compared (logically enough) Dublin and Belfast. Some of this entanglement has been got rid of in the last balance-sheet issued, where for the first time we do see the cost of materials for carburetted water gas separated from wages and wear and tear.

But two other striking changes appear on this last account—thanks, I suppose, to Mr. Dickens. The revenue account now shows two fresh receipts—Stove Rent No. 11 and Fittings No. 12; and as these are, together, close on £5000 in amount for the half year—say, £10,000 a year—the shareholders may desire, as I do, to know why they have always previously been omitted? What has been done with the money? And why have the auditors permitted such glaring departures from the statutory form of accounts? Have the Directors themselves been aware of these suppressions?

If this money also has gone into slots, it means close on another 2d. per 1000 cubic feet; and in any case your expert readers will be wondering why the competition of electric light was not beaten off and the Company's business preserved and extended as it has been elsewhere by reasonable reductions in the price of gas, instead of this waste.

But this extra 4d. or 6d. per 1000 feet seems to have been squandered in seeking unremunerative business with labour class consumers who cannot afford to burn gas at the Dublin price. They only take 5000 or 6000 cubic feet per annum, against London's 15,000 to 20,000 cubic feet. Nor could it ever be expected, for while the area of the Dublin Gas Company is greater than that of the London Gas Light and Coke Company, it consumes one-twentieth (5 per cent.) only of the gas sold by that Company. Apart from the enormous capital cost—£8 each, against £4 in London—look at the terrible increase in distribution maintenance compared not only with Belfast, but with any English gas concern of equal scale, most of which would contain more than adequate replacement of capital.

It is certainly to be hoped the new Board will, among other things,

peremptorily stop this unreasonable disproportionate expenditure, at any sacrifice, personal or other.

But my chief object in writing is to remind your readers of the fact that this undertaking has for many years had an expert on its Board, and one of great skill and ability, which was amply proved by the eminent services he rendered the shareholders and consumers in the early days, when he wrought order out of the chaos of the old amalgamated Companies, and brought profit where loss reigned before. I mean the Chairman, Alderman W. F. Cotton; and, as an old friend, I deplore the day when becoming absorbed in political duties he resigned the active general management of the Company, and specially the distribution department, into feebler and less experienced hands. He has reason indeed to complain that his trust has not been better maintained.

Palace Chambers, Westminster, April 14, 1914. HY. E. JONES.

Working Operations at Falkirk.

SIR,—In "Works Topics" of April 14, your contributor, "Modus Operandi," comments on some portions of my presidential address.

His remarks regarding the filling of furnaces when working heavy charges are quite correct, as there are not very many works in Scotland to which this might apply. Still there are a few. In my own case our settings were eight retorts (three retorts being on the top, three in the middle, and two in the bottom row), which is a very usual style of setting in Scotland, although it was not usual to have the retorts 20 feet through, with a producer at one side only. Such a setting throws an extra duty upon the producer. We were among the first in Scotland to adopt such a style of setting; and a number of works have followed suit. It was to these that my remarks more particularly applied.

We raise or lower our machines to operate each row of retorts horizontally—that is, we take all the top row at one round, all the middle row for the second round, and all the bottom row for the third round. It was quite impossible to get the two bottom retorts into the furnace, and only possible to get the centre retort of the middle row. The side retorts of the middle row could only have been got in with a considerable amount of labour, owing to the position of the furnace mouth. When working charges of four hours' duration, the furnace had to run without feeding for about three hours; when working six-hour charges, the furnace had to run four hours; and when working eight-hour charges, it had to run about five-and-a-half hours.

I am pleased to see that "Modus Operandi" agrees that regular feeding of the furnace is desirable. I concur with "Modus Operandi" that four hours is long enough for any producer to run without feeding. I may say I have altered these settings and converted them into nines—putting an extra retort in the centre of the bottom row, and at the same time projecting the furnace, which, of course, increases the area of the furnace. This overcomes the difficulty, as we can charge one retort at least from each row into the furnace, if required.

The accumulation of ash in the furnace must also be taken into account; and with the class of coals which we use here, we cannot run more than twenty-four hours without clinkering. As the clinkering period approaches, less fuel can be got into the furnace. In 1909, we extended our retort-bench by converting seven ovens of eights into twelves, by adding one centre retort to the bottom row, and another tier of three retorts on the top. In this case also we projected the furnace. We find that eight-hour charges suit these settings very well. One row of retorts is taken every two hours; so that the furnace can be fed every two hours, if necessary.

Regarding the question of naphthalene stoppages, and the quantity of shale naphtha required, I regret I cannot give "Modus Operandi" any definite information as yet regarding this. Acting on his hint (for which I am obliged), I have made an investigation of the district syphons, and find not the slightest trace of this naphtha. This is just as I expected. I find that since the introduction of the oil film to the water in the gasholders, our district syphons have become practically dry (free from water). Syphons which we had to pump frequently before are now "blowing," which points to the drier condition of the gas now being sent out. The gas in this condition will, I believe, more readily reabsorb the naphthalene deposits in the mains and services and carry it off.

WM. WILSON, Engineer.

Falkirk Burgh Gas-Works, April 17, 1914.

Gas Water-Heaters, with Some Gas and Coke Comparisons.

SIR,—The question of gas *versus* coke for water heating was mentioned in your issue for Nov. 11 last by a correspondent ("P. B."), who quoted the cost of coke for the purpose of domestic hot water supply, and asked (among other information) for particulars of daily consumption of gas, to which further reference is made in the issues of Dec. 11 and Feb. 3 last. Pressure of business has prevented me replying to this inquiry before; but I have some notes by me which may be of interest to your correspondent, and so have incorporated them in this letter.

Dealing with the question of reliability of the thermostat, there is no difficulty in, or doubt of, obtaining complete satisfaction from these; and a properly constructed valve does not require attention even once annually, although, being of a somewhat delicate nature, a small percentage does sustain damage to the capsule. This, however, is immediately detected, and there can be renewal at an outlay of but a few shillings.

As an instance of the efficiency of thermostats, I might mention that apparatus we have fitted for the hot water supply to staff lavatories in the show-rooms of various London gas companies are provided with them. The plants in many cases have been installed for upwards of five years; while there are many thousands in daily use in residences throughout London and the Provinces.

Another point Mr. Benham touches upon—that of cleaning—is an important one. While gas-boilers, being automatically controlled, are somewhat differently situated from kitchen ranges and other appliances using solid fuels as regards the formation of lime deposit and the fouling of the flues, it is most essential that all waterways and flue passages be accessible for cleaning without disconnecting or removing the boilers; otherwise the cleaning cannot be properly maintained. In this case, the non-conducting effect must, of course, lower the efficiency to a certain degree. To these requirements we have given practical attention in the "Victor" gas-boilers. Any local fitter can deal with them; and, with periodical attention, as working conditions demand, there is no reduction in the duty or loss of heat. Dealing particularly with the flue question, the use of atmospheric burners avoids the formation of soot; and I therefore adopt this form of combustion, except in special cases.

Mr. Benham made special reference to the question of daily consumption in gas heating for comparison with coke apparatus. Having recently obtained some data in this connection, I am able to quote the figures. I have also had coke tests made to supply information that is as reliable as possible, because the conditions surrounding the action of the two systems are otherwise likely to differ very materially without considering the uncertainty in the demand for hot water—thus making the results difficult to compare.

The gas appliance used for the test was a No. 21 "Victor" complete apparatus; and during the day hot water was drawn at intervals in small quantities (as for cleaning), with the addition of three baths and water for bedroom use in the morning and evening.

Test of Gas-Heated Hot Water Supply Apparatus.

(APRIL 3, 1914.)

Temperature of cold water, 49° Fahr.

Time.	Gas Used. Cub. Ft.	Water Drawn. Gallons.		Temperature. Fahr.	
Gas lighted—6.45 a.m.	—	—	—	—	
7.30	31	2	Bedroom	160°	
7.35	—	20	Bath	107	(bulk)
8.45	70	4	Culinary	166	
9. 0	—	2	,,	158	
9.12	—	1	,,	157	
9.24	—	1	,,	166	
9.36	—	1	,,	163	
9.48	—	1	,,	167	
10. 0	—	1	,,	167	
10.12	—	1	,,	165	
10.30	—	1	,,	165	
10.45	—	1	,,	165	
11. 0	—	1	,,	167	
11.30	—	1	,,	165	
1. 0 p.m.	—	3	,,	163	
3. 0	—	2	,,	158	
3.30	—	1	,,	154	
4. 0	—	1	,,	154	
5. 0	170	2	,,	152	
6.30	—	4	Bedroom	154	
7.30	—	4	Culinary	152	
8.30	—	20	Bath	112	(bulk)
9.30	230	20	,,	108	,,

The foregoing totals a supply of 35 gallons for culinary and general purposes, in addition to warm water for three baths, at a total consumption of 230 cubic feet, which, at the South Metropolitan Gas Company's rate (2s. 2d. per 1000), costs 6d. This, it should be noted, is under high temperature working conditions suitable for any household purpose, adding the necessary cold water. While this may possibly be slightly more costly than coke, the temperature, convenience, and cleanliness should certainly be considered in recording the results and comparisons.

The result of the coke test, using an ordinary dome-top boiler (size, 36 in. by 15 in. diameter), applied to the same sized cylinder and piping as the gas-heater, is as follows:—

Test of Coke-Boiler for Hot Water Supply.

(APRIL 8, 1914.)

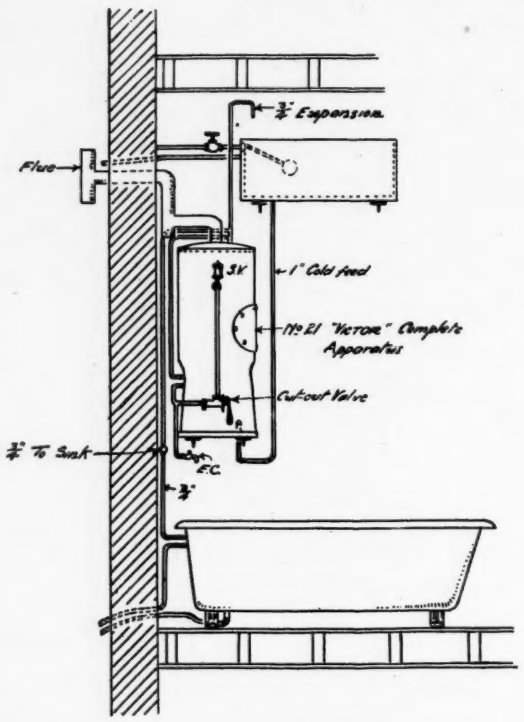
Temperature of cold water, 47° Fahr.

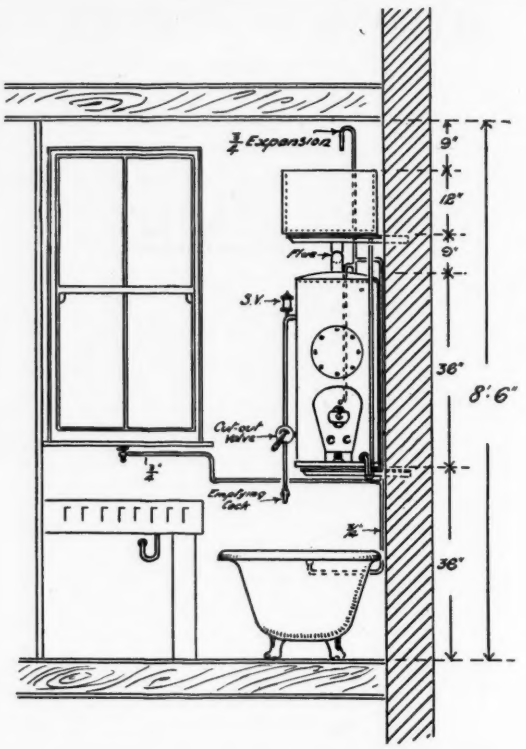
Time.	Water Drawn. Gallons.		Temperature. Fahr.		Fuel Used.
Fire lighted—6.45 a.m.	—	—	—		2 lbs. wood 7 lbs. coal
7.30	2	Bedroom	152°		6 lbs. coke
7.35	20	Bath	132 (bulk)		—
8.45	4	Culinary	147		—
9. 0	2	,,	145		6 lbs. coke
9.12	1	,,	140		—
9.24	1	,,	159		—
9.36	1	,,	165		—
9.48	1	,,	173		—
10. 0	1	,,	168		—
10.12	1	,,	167		—
10.30	1	,,	163		—
10.45	1	,,	162		—
11. 0	1	,,	164		—
11.30	1	,,	159		3 lbs. coke
1. 0 p.m.	3	,,	184		—
3. 0	2	,,	172		—
3.30	1	,,	160		3 lbs. coke
4. 0	1	,,	148		—
5. 0	2	,,	143		½ lb. wood 3 lbs. coke
6.30	4	Bedroom	174		—
7.30	4	Culinary	162		—
8.30	20	Bath	115 (bulk)		—
9.30	20	,,	71 ,,		—

Consumption of fuel—21 lbs. coke
7 ,, coal
2½ ,, wood

Your correspondent is at liberty to come and check these figures.

The average cost of the fuel used for the day's stoking would be about 5d.—running the amount expended on gas very closely, though the water temperatures with gas heating are somewhat higher; and it is in producing high temperatures that the fuel used increases, so that





for ordinary domestic hot water supply in houses of moderate size my experience is that the cost of coke runs gas very closely.

Dealing with Mr. Benham's figures, he states that the fire is lighted at 7 a.m., and the first hot bath taken in thirty to forty minutes. He does not, however, mention temperatures; and it would be interesting to know the temperature of the hottest water available, together with the amount of water that is drawn into the bath and the temperatures of the bulk.

It is assumed that the fire would be kept going from 7 a.m. to 8 p.m.; and this, at a total cost of 1s. 3d. per week for coke, would average 16 lbs. for a day's use, although, to produce the results in the foregoing day's test, I show that about twice this quantity of fuel would be required—raising the cost with the value of wood and coal for lighting to something in the region of 3s. to 3s. 6d. per week.

It is, of course, recognized that, heat for heat, coke is the cheaper fuel; and where large requirements have to be provided, it is more economical than gas. But for the average household, owing to the economy that can be practised, together with the convenience and labour-saving advantages, the running cost is rendered reasonably proportionate, and accounts for the popularity of gas for the purpose of domestic hot water supply.

A further example of the convenience afforded by the gas-heated apparatus is shown in some investigations recently carried out in connection with an inquiry by the London County Council. The Housing Department have had for some time under consideration the question of hot water supply for their tenements, and have been investigating the merits of various gas appliances, for which purpose three officials of the Council met at a gas company's laboratory in January last.

The primary object of the test was to ascertain the working conditions of hot-water apparatus for the requirements of artisan dwellings in which slot meters are used. A No. 21 "Victor" apparatus (self-contained type, with boiler and storage complete) was fitted up, with supply cistern above, to suit the room—8 ft. 6 in. high. The two diagrams illustrate the apparatus as arranged for the test.

The test was started at 3.17 p.m. by placing a penny in the meter and burning 27 feet of gas at the rate of 40 feet per hour, which occupied forty-four minutes. At 4.1 p.m. 20 gallons of water were drawn into the bath in the laboratory, the hottest water at the tap (at the commencement) registering 166° Fahr., while 20 gallons in bulk in the bath were at a temperature of 108° Fahr.—cold water being 58° Fahr. at the start. The bath used was a 4 ft. 6 in. taper type, and the depth of water with 20 gallons was 9 inches.

The foregoing cannot be taken as a test of efficiency, as, being of the separate boiler and storage type, the contents of the boiler proper are not included in the water drawn. But it served to show that small quantities of hot water for sinks and cleaning purposes, at an average temperature of 150° Fahr., can be obtained within twenty minutes, or larger quantities at a lower temperature for bath purposes in about forty minutes, or less when in constant use.

Cavendish Works, Balham, April 15, 1914. T. POTTERTON.

Newport Corporation Bill (Session 1914).

SIR,—It is very rarely indeed that any need arises, in connection with the reports in the "JOURNAL OF GAS LIGHTING," to offer a correction; but I shall be obliged if you will permit me to correct an almost obvious misapprehension in your report of my cross-examination by Mr. Keen last month [*ante*, p. 50] during the course of the evidence taken before the Committee of the House of Lords appointed to inquire into the above Bill.

Your report states that Mr. Keen in cross-examination said "that for depreciation of plant . . . the money needed by the Company could be taken from their capital." Mr. Keen did not make any such suggestion; and therefore I need not say I consequently could not give any assent, which, in any case, I would not do to such a view.

At that particular part of my cross-examination, the questions put turned upon a matter of considerable interest—namely, the comparable basis between a company raising capital and paying dividend thereon, and a corporation raising capital by loan, paying interest thereon, and creating a sinking fund to extinguish the capital at the termination of an appointed period of years. This line of cross-examination went on for some time, and no doubt was interesting, but was brought to a conclusion by the Chairman of the Committee (the Marquis of Bath), who, with our able Counsel, Mr. Balfour Browne and Mr. Paddon, considered that it was argumentative, to which Mr. Keen agreed. Neither of us mentioned the word "depreciation."

Gas-Works, Newport (Mon.), April 15, 1914. THOS. CANNING.

Automatic Controllers at Bath.

Some seven years ago, Mr. C. Stafford Ellery, the Engineer to the Bath Gas Company, had some Horstmann controllers fitted in the Upper Oldfield Park district; and he has now recommended the Council, and they have agreed, to adopt the system for the lighting and extinguishing of the whole of the street-lamps in the city. The type of Horstmann controller to be used is that in which the adjustment of the times of lighting and extinguishing is by automatic means, thus requiring no setting. In connection with these negotiations, the "Bath Chronicle" has published an article in which attention is drawn to the importance as a local industry of the manufacture of the Horstmann appliances, which is carried on by the Horstmann Gear Company at No. 58, Walcot Street, Bath, where fifty hands are now employed. The paper says: "This concern was in its experimental stage seven years ago; and since that time it has grown and extended beyond the most sanguine expectations of its founders. Before the business was started, automatic lighting had been known for a number of years. In fact, as far back as 1864 experiments were made with an invention for turning on street-lamps by clockwork. But it remained for Messrs. Horstmann to perfect the system; and now their device is known, not only all over England, but throughout the civilized world. . . . . Messrs. Horstmann have devised no fewer than nine different types of controllers, to meet the varied requirements of different gas companies. . . . . These instruments are now in use in large quantities in the Antipodes, while many European countries are adopting the system. Last year, a very important licence was entered into with the largest street-lighting syndicate of America, whereby Messrs. Horstmann draw considerable royalties. . . . . A recent development is the adaptation of the controllers for use in lighthouses, lightships, and buoys; the controllers for this purpose being made in duplicate form, to prevent the possibility of the light failing. The light remains on permanently should the clock run down, and rough weather prevent a visit to the station. Approximately 12,000 controllers were supplied last year." We learn that, in addition to the Bath order, large installations are at the present time in hand for Liverpool, Walmer, Hastings, Rugby, Derby, and other places.

Fylde Water Board.—Alderman John Bickerstaffe, J.P., Chairman of the Fylde Water Board, referred at the last meeting to the death of the late Mr. Thomas Fair, and said he was the last survivor of the originators of the Fylde water supply, and that he surveyed the whole of the Fylde district in connection with the original scheme. He was for a long period a Director of the old Company, and for twelve years was the Vice-Chairman.

REGISTER OF PATENTS.

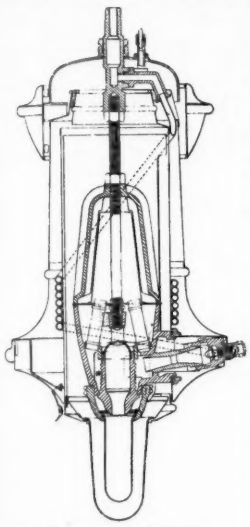
Gas-Lamps.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 17,170; July 26, 1913.

This invention in high-pressure inverted incandescent gas-lamps of the type provided with a heater for the mixture associated with a metallic nozzle of good heat-conducting capacity in thermal contact therewith, is like that described in patents Nos. 28,360 of 1907, 13,865 of 1911, 1348 of 1912, and 14,489 of 1913.

The primary object of this invention is to provide for direction of the mixture in contact with hot portions of the structure comprising the heater, nozzle, &c., along a course comprising stages representing, as far as conditions will permit, what are practically zones of progressively increasing temperature, so that the mixture will be progressively heated, and at the same time (while itself still comparatively cold) abstract heat from those parts of the structure the temperature of which should be maintained within safe limits having regard to the explosive nature of the mixture and the liability to destruction or deterioration of the metal.



Keith's Incandescent Lamp-Nozzle.

In a lamp embodying the invention, the nozzle (as shown) extends upwardly with the interior of the heater—the extension being preferably provided with corrugations affording a radiating surface—so that an annular space is left between the upper extension of the nozzle and the lower extremity of the heater, a perforated casing, serving as a partition, being fitted within the annular space. The injector tube has a preferably insulated connection with the structure at a point in close proximity to the upper extension of the nozzle—being preferably in tangential relation with the latter, so that the mixture is first caused to circulate around the extension of the nozzle, and then pass through the perforations into contact with the inner surface of the lower end of the heater.

The upper end of the extension of the nozzle is connected to an annulus sustained by the heater—*e.g.*, is in screw-threaded engagement with the annulus, which latter is cooled by contact with the mixture, and serves to take-up heat from the nozzle, besides affording an additional path for heat travelling from the nozzle to the heater. The annulus is formed as a tube plate, into which are fitted the lower ends of a number of tubes which may be of heat-insulating material, or covered with heat insulating material, and the upper ends of which enter orifices in a disc or partition extending transversely of the heater, preferably at the junction of its halves, and provided with perforations at or near its periphery. Rising from the disc is a tubular connection forming a compartment into which the tubes lead, and extending to near the upper end of the heater.

Distilling Bituminous Matters.

AARTS, J. G., of Dongen, Holland.

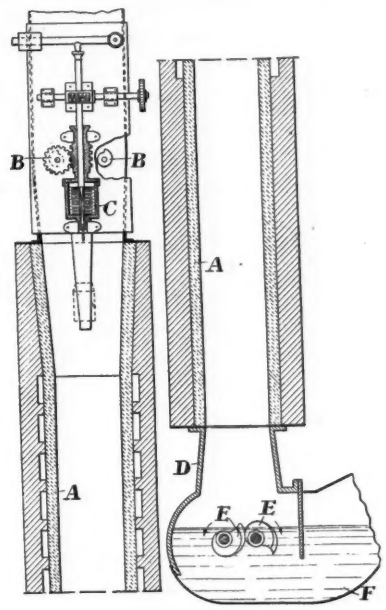
No. 17,661; Aug. 1, 1913. Convention date, Aug. 1, 1912.

This invention relates to a method of distilling bituminous matters wherein the charge is caused to descend continuously within a vertical retort and is subjected to fractional distillation by exterior heating of the upper portion of the retort, and which heating gradually increases to a point of maximum temperature. Owing to the external heating of the upper portion of the retort, the patentee points out, the distillation products ascending from the zone of maximum temperature of the charge are caused to aid the distillation in the cooler upper zones; the ascending current and the heated charge moving in opposite directions—that is, on the counter-flow principle.

Heretofore in carrying out such a method, the charge has been packed in the retort so that the coke produced is of dense and solid structure throughout, which the ascending distillation products forming the current have to penetrate.

According to the present invention, however, the charge is not packed so as to produce a dense and solid structure, but only in such a manner that the density of it is a minimum at or near the centre of the charge, and a maximum at the outer peripheral portions. "Owing to this manner of packing the charge the ascending distillation products are caused to converge towards the centre of the charge, so that the interior thereof is subjected to the action of a heated secondary localized current, which localized current is much more effective than a current which is not localized and penetrates throughout the whole charge."

At the level of the maximum temperature, the specification proceeds, the whole mass which passes through the maximum temperature zone is distilled and coked. The further descent of the charge takes place through the non-heated lower portion of the retort, during which descent cleavage lines are formed in the continuation of the vertical zone of the least density of the charge undergoing distillation. The carbonized mass is then further cooled by the utilization of the heat of the red-hot coke for producing steam, which ascends within the carbonized mass principally through the cleavage lines, and is transformed into hydrogen and carbonic acid gas, which latter is reduced to carbonic oxide. These gases reach the zone of maximum temperature, mix with the ascending and converging currents of the gaseous products of distillation, and expel or drive the products in a nascent state out of their zone of formation into a zone of lower temperature and lesser density—the inherent heat of the gases being gradually given off to this zone.



Aarts' Continuous Vertical Retort.

The accompanying diagrammatic illustration is of a retort adapted for carrying out the process.

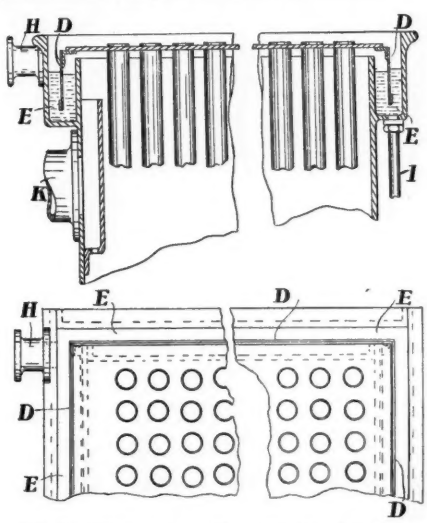
The retort A has a uniform section along its whole height, and has no mechanical closure at the top—the charge itself ensuring a sufficiently tight closure against the escape of the gas within the lower portion. The compression of the charge takes place in a constant degree along the longitudinal walls by compressing means B, which are driven through the intermediary of a friction clutch C, which may be adjusted to the desired degree by compression. The retort terminates at its lower end in a chamber D, immersed in, or filled with, water to a suitable level so as to obtain a liquid seal at F, through which the cut-off carbonized products may be removed—for instance, by means of an endless transport device. The disintegrating means may consist of cams E provided with cutting projections.

Condensers for Gas-Works.

BEARD, G. F. H., SCOTT, J. W., and R. & J. DEMPSTER, LIMITED, of Manchester.

No. 26,970; Nov. 24, 1913.

The object of this invention is to provide vertical condensers with that type of tube plate which moves to compensate for the longitudinal expansion or contraction of the tubes attached to it, but which, according to the invention, is adapted to allow of the flow of the cooling liquid over the edge of the tube plate—"thus enabling a top water compartment to be dispensed with, and, in some cases, providing additional cooling means for the condenser."



Beard & Scott's (R. & J. Dempster) Gas-Condensers.

The condenser shown is fitted with water-tubes for cooling the gas, with a top plate supporting the upper ends of the tubes and ordinarily forming the base or floor of a water-chamber above, usually provided with an overflow pipe. The top plate is formed with an extension D surrounding it, and constantly submerged to any desirable extent

within the water in a chamber E, thus forming a seal therewith. An overflow pipe H is provided, and means for emptying the cavity E, or for removing accumulated foreign matter or dirt, are shown at I consisting of a pipe provided with a sludge cock.

On the entrance of the gas to be cooled through the inlet pipe K it cannot escape through the water seal E under normal working conditions of the exhauster; but should the latter cease acting from any cause, excess of pressure of the gas may be relieved by the escape of the gas through the seal—the head of water provided therein being arranged suitably for the purpose.

The condenser tubes being fixed at their lower ends to the plate below, expansion or contraction in the length of the tubes can freely take place by the unobstructed movement of the plate and the extension D within the seal space E.

The water for cooling the gas through the metal of the water tubes may be forced up them in any suitable manner, and, after passing through them instead of collecting in a water-chamber above the tubes, the water is allowed to run off the edges of the plate into the seal space E—excess of liquid being allowed to pass out through the pipe H and thus enable the required level of liquid in the seal space to be maintained.

Caulking Lead Joints in Iron Mains, &c.

Toon, C., of Christchurch, New Zealand.

No. 20,820; Sept. 15, 1913. Convention date, April 2, 1913.

This invention refers to the type of caulking device which comprises a tubular flanged member adapted to be arranged around the pipe and moved longitudinally of it, so that its free edge compresses the packing material between the pipe end and the socket containing it—the device being formed in two parts to facilitate positioning upon, and removal from, the pipe. The caulking device is arranged so as to be applicable to pipes of slightly varying diameters or to compensate for wear; and, furthermore, the device can be centralized on the pipe. The caulking device consists in the combination with a circular tool adapted to be arranged around the pipe of a "dolly" or driving member provided with adjustable centralizing bearing or contact members; while the driving member or dolly itself may be formed in two parts, adapted to be secured together, and the circular tool, also formed in two parts, may be adjustably mounted on the driving member or dolly.

Incandescent Gas-Mantles.

Robin, J. I., of Great Titchfield Street, W.

No. 28,285; Dec. 8, 1913.

In carrying this invention into effect, the patentee employs two threads, one of which is impregnated, while the other is non-impregnated; the latter thread being preferably given some distinctive colour, so that it may be readily distinguishable from the impregnated thread, which is of the usual white or cream colour. In this way the appearance of the finished fabric is said to be "distinctly ornamental," and during the knitting or weaving operation, which is carried out in any usual manner, it is possible to determine which kind of thread has broken should breakage occur. The results obtained may, it is claimed, be further increased by employing an impregnated or unimpregnated thread that has already been knitted into a fabric, so that, when the thread is pulled from the fabric before being re-knitted into a fabric according to this invention, it is of "corrugated" (wavy) form.

APPLICATIONS FOR LETTERS PATENT.

8638.—King, J., Burnett, J. R., Richmond Gas Stove and Meter Company, Ltd., and Mead, A., "Gas-heated furnaces." April 6.

8657.—Franke, H., and Michael, P., "Water-meter" April 6.

8671.—Bouchard, A. C. A., "Lighting and extinguishing lamps." April 6.

8709.—Ionides, P. D., and Power Gas Economy, Ltd., "Valves." April 6.

8713.—Kinsley, H., and Atkinson, T. N., "Incandescent burners." April 6.

8740.—Drakes Limited and Drake, W. A., "Regenerator furnaces for vertical retorts." April 7.

8829-30.—Glasgow, A. G., "Vertical gas-retorts." A communication from J. H. Taussig. April 7.

8863.—Brookman, S. G. G., "Automatic gas-controller." April 8.

8898.—Sadler, H. S., and E. Cockey and Sons, Ltd., "Valves for gas." April 8.

8907.—South Metropolitan Gas Company and Chandler, D., "Gas cooking-stoves." April 8.

8913.—Welsbach Light Company, Ltd., and Barford, A. R., "Cluster burners." April 8.

8961.—Tooth, L. F., "Gas-furnaces." April 9.

8993.—Brooks, C. E., "Gas-engines." April 9.

9034.—Davidson, W. B, "Producing coal gas." April 9.

9040.—Bentley, G. H., and Appleby, E. G., "Gas-generators." April 9.

9097.—Keith, J. & G., "Pilot lights." April 9.

9147.—Carmichael, D., and Marr, A., "Acetylene generators." April 11.

9149.—M'Laren, D., "Increasing the efficiency of bunsen burners." April 11.

9154.—Poetter, G. M. B. H., "Gas-generators." April 11.

9174.—Yates, H. J., "Gas-fires." April 11.

The re-registration is announced of the Woburn Gaslight and Coke Company, Limited, as on the 9th inst. The capital of the new Company is £2000 in £10 shares, all of which have been issued and are fully paid up.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: British Gas Company (Hull Station); Cleckheaton Urban District Council; Leighton Buzzard Gas; Llanfaelog Water; Newport Corporation; South Bank and Normanby Gas; Stone Gas and Electricity.

Notice was given for the rejection of the Southend Gas Bill on the third reading.

The petitions of the Walsall Wood Colliery Company and William Harrison against the Walsall Corporation Bill, and of the Lytham Urban District Council against the St. Anne's-on-the-Sea Improvement Bill, have been withdrawn.

The following petitions against private Bills were presented: Yorkshire (Woolen District) Electric Tramways against the Cleckheaton Urban District Council Bill; Leighton Buzzard Urban District Council against the Leighton Buzzard Gas Bill; Eric James Walter Platt against the Llanfaelog Water Bill; Great Western Railway Company against the Newport Corporation Bill; and the Great Northern Railway Company and Skegness Urban District Council against the Skegness Gas Bill.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Half-Yearly Report.

At the Half-Yearly General Meeting of the Association on the 5th prox. the Directors will present the following report (which is accompanied by the accounts) on the results of the Association's operations in the six months ended the 31st of December.

The profit of the half year was less by £3271 14s. 11d. than that of the corresponding half year of 1912, and amounted to £232,988 3s. 7d., which, together with the sum of £42,747 4s. 2d. brought forward from the previous half-year's account, makes a total of £275,735 7s. 9d. available for appropriation, compared with a profit of £236,259 18s. 6d., and an available total of £280,868 2s. 3d., on the 31st of December, 1912. The Directors recommend a dividend for the half year ended Dec. 31, 1913, at the rate of 4½ per cent., less income-tax.

The total output of gas in the towns supplied by the Association increased in the second half year of 1913 by 4·47 per cent., or about 260 million cubic feet. The number of consumers on the 31st of December last was 500,881, or greater by 6·82 per cent. than at the corresponding half year of 1912.

The total number of meters in use at the end of the second half year of 1913 was 566,221, of which 183,072, or 32·33 per cent., were prepayment meters. At the end of December, 1912, the total number of meters in use was 539,378, of which 165,211, or 30·62 per cent., were prepayment meters.

In the half year under review, 108 miles of new mains were laid; making a total length on the 31st of December, 1913, of 2429 miles.

The plant and mains at all the stations were maintained in their usual efficient condition.

The quantity of coal carbonized in the second half year of 1913 was 510,015 metric tons (or 24,328 tons more than in the corresponding half year of 1912), at an average gross cost delivered on to the works of 19s. 0·38d. per ton, or 1s. 8·56d. per ton more than in the second half year of 1912.

The oil used for the manufacture of water gas amounted to 1920 tons, or 1154 tons less than in the second half year of 1912. This decrease was due to less water gas being produced, owing to the high price of oil ruling during the period under review.

The value of the coke produced was higher than that realized in the corresponding half year; and tar also showed an improvement. But the values of ammoniacal products showed a considerable decrease.

The following new exclusive contracts for the supply of gas were concluded with suburban communes of Antwerp—viz., with Beirendrecht and Santvliet until the 31st of December, 1947, and with Broechem, Emblehem, Oeleghem, and Ranst until the 31st of December, 1948. The existing exclusive gas contract with Schönefeld (a suburb of Berlin) was prolonged until the year 2000, with a subsequent perpetual, but non-exclusive, right of supply.

At Brussels, contracts securing to the Association monopolies of the supply of gas and electricity until 1948 were concluded with the suburban communes of Dilbeek, Neder-Ockerzeel, Steyn-Ockerzeel, and Rhode St. Genèse; and the existing contract with the Commune of Droogenbosch was prolonged to the same date.

An exclusive contract until 1950 was concluded with the Commune of Ronnenberg, a suburb of Hanover.

At Antwerp, three new benches of vertical retorts referred to in the last report were completed and put in action; a fourth bench being still in course of construction. The trial Glover-West furnace at Mariendorf, Berlin, was also completed.

Progress was made with the erection of the new electrical coal-handling plant on the Forest Works at Brussels; and the 4000 K. W. turbo-dynamo on the Droogenbosch electricity works, referred to in the last report, was put in action with satisfactory results.

The Directors who go out of office by rotation are Sir Corbet Woodall, D.Sc., Hugh Goodwin Newton, Esq., and Colonel Herman Le Roy Lewis, C.B., D.S.O. The Auditor who goes out of office by rotation is Theodore Bromhead Bassett, Esq. These gentlemen are all eligible for re-election, and offer themselves accordingly.

PRIMITIVA GAS COMPANY OF BUENOS AYRES, LTD.

The Annual General Meeting of this Company was held last Friday, at River Plate House, Finsbury Circus, E.C.—Mr. E. A. BOWEN in the chair.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

IMPROVEMENTS IN FACE OF ADVERSE CIRCUMSTANCES.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, on the whole, he thought the shareholders would consider that the Company had had a fairly satisfactory year, inasmuch as the net profits realized were £33,500 more than in 1912; and this notwithstanding the fact that times had been very bad in Argentina, and especially in the City of Buenos Ayres, where financial stringency had ruled throughout the year to such an extent as almost to constitute a crisis. When he told the shareholders that in the City of Buenos Ayres, at the end of the year, no less than 25,000 dwelling-houses and offices were vacant, they would realize how bad things were, and be satisfied with the way in which the Company's business had maintained itself. There was a considerable decrease in the quantity of gas sold for private lighting and for public lamps; but this was more than made up by a substantial increase in the sales of gas for heating and power, so that the total sales were somewhere about 1 per cent. more than in 1912. This was the smallest increase the Company had had since the amalgamation of the Companies, and, indeed, for many years before that. But it was entirely accounted for by the commercial depression and monetary stringency in Buenos Ayres. The demand for all the Company's materials, and especially cooking-stoves and heating appliances, had been well maintained; and the Company had done better in this direction than in the preceding year. They had been helped to some extent by a fall in freights, so that the coal carbonized cost about 2s. per ton less than in 1912—making a difference of somethiug like £18,000. On the other hand, the small quantity of oil used cost approximately 8s. per ton more. But only a very small amount was used, because the cost was almost prohibitive. The Company had been very fortunate in not having had any serious labour troubles in Buenos Ayres during the year under review. They had, therefore, been able to bring down the cost of manufacture and obtain a better yield of gas per ton of coal; and this had enabled them to show the satisfactory improvement in the profits to which he had referred. Since the beginning of this year, freights had fallen considerably; and the Directors hoped, when reviewing the situation this time next year, to be able to show even a better result in consequence of this fall, even if things did not improve in Buenos Ayres, which he hoped and believed they would do. He might remind the shareholders that the price of gas was fixed for the twenty years of the concession—fixed to this extent that there was a sliding-scale in accordance with the quantity of gas sold; but the base price was fixed, and the Company had to stand the loss of any advance in the price of coals or freights. There were some indications also of lower prices for coals. The strike in South Yorkshire had not caused the Company any anxiety, as they had very large supplies in Buenos Ayres; and all the coals required up to the end of this year were contracted for.

LARGE MAIN-LAYING OPERATIONS.

It would be noticed from the report that the Company had been very busy with main-laying during the year. Some 21¼ miles of mains had been revised, repaired, removed, and renewed, and, in addition, the network had been increased by 45 miles—bringing the total up to 1106 miles. On balance, there had been added 7479 new services, bringing the total to upwards of 200,000. This, naturally, had required a considerable amount of capital expenditure, amounting during the year to £183,490. Of course, a gas company could never stand still, especially when it had a monopoly in a very large and growing city like Buenos Ayres.

PUBLIC LIGHTING, GENERAL UPKEEP, AND CHEMICAL WORKS.

He believed that he informed the shareholders last year that the Directors had made a contract with the Municipality for a considerable extension of the public lighting. They had to get the total up to 20,000 lamps; and to-day they were lighting 16,427, which meant that they had 3573 lamps remaining to be fixed within two-and-a-half years at the latest. There had been taken down, and refixed in other places, 4992 public lamps; and most of these had been refixed in outside districts, where the Company had had to lay new mains. During the year a considerable amount of money had been spent on the general up-keep and renewal of plant, buildings, and machinery, both within the works and on the outdoor services; and the result was that everything was kept in good repair and thorough working order—of course, at the charge of revenue. He had also to point out that the expected large profit from the new chemical works had not been realized during the year, because, owing to contractor's delays, the works were not finished and in full operating order until October last. But they were now in full swing; and the General Manager stated that he anticipated that substantial profits would be made by the department when business improved in the Argentine.

CAUSES AND EFFECTS.

The Chairman next referred to the partial failure of the wheat and linseed crops in the Republic, and to the fact that the gold in the conversion office had fallen to $230,459,000 from $253,584,000 in the corresponding week of last year. This was only to be expected; and no doubt a lot of the gold would go back when the maize was exported. The profits for the year were adversely affected by the difficulty in collecting the accounts; and the Company had had to write-off a good many bad debts. They had, of course, only taken into the accounts the actual collections, and the December outstandings which were collected in January. For everything in any way doubtful, provision had been made. He was glad to be able to say that the relations of the Company with the Municipality continued to be very cordial; and there had been no trouble with them during the year.

ACCOUNT COMPARISONS.

Running through the accounts, and taking the balance-sheet first, he had already referred to the £183,490 spent on capital account during the year. With regard to the electric section, the German Electricity Company had continued to pay with the greatest regularity. The Directors had written £5000 off the expenses of issue of the 4 per cent. debenture stock (1911); bringing the item down to £24,429. Sundry debtors and debit balances were £229,211, as compared with £207,650 last year. Stock of coals, oil, &c., in Buenos Ayres stood at £551,567, as against £459,935. Investments totalled £44,700, as compared with £46,846. Out of revenue, £35,000 had been provided for the Retiro works amortization account; making the amount written off to Dec. 31 last, £140,000. Bills receivable and cash were items which explained themselves. On the debit side, the capital issued was the same as last year. Of the first debentures, £10,700 had been amortized; thus reducing the amount outstanding to £491,600 from £502,300. The Directors had also provided the usual sinking funds for the River Plate and Buenos Ayres (New) debenture stocks—together £6826. The 4 per cent. debenture stock (1911) was now £600,000; the whole of the last issue of £400,000 having been paid up. Sundry creditors and credit balances were £121,478, as compared with £125,122. The old age and pension fund stood at £7174, against £8645. With regard to profit and loss, the revenue account was £340,474, as compared with £309,453. The balance carried to appropriation, was £274,424, which compared with £253,067 last year. As to the distribution of this profit, it was proposed to provide £2000 for the old age and pension fund. He had already referred to the £5000 written off the expenses of the issue of the (1911) debenture stock, and also to the £35,000 written off the Retiro works amortization account. The Directors proposed to make up the dividend to the usual 8 per cent. (subject to tax) and to carry forward £43,905, as against £40,480 brought in last year.

FURTHER CAPITAL NECESSARY.

Concerning the future, it was necessary to provide a little more capital for the purposes he had already mentioned; and so the Directors had decided to issue to the ordinary shareholders the remaining 40,000 ordinary shares authorized. Allotment letters would be sent out, offering the shareholders one new share for every seven shares held at present, at the price of £6 per share—£3 to be paid at once, and the remaining £3 on or before June 30 next. These new shares would rank *pari passu* with the old ones. and would, of course, get the usual interim dividend in October next. He had no doubt whatever that the shareholders would all be glad to take their proportion of this cheap offer. The shares had not been underwritten in any way. In conclusion, he should like to say how much the Board appreciated the hard work done by the Local Committee and General Manager in Beunos Ayres during the year, and the way in which they had carried out the urgent instructions of the Directors to reduce expenditure in every possible way during these bad times.

Mr. H. E. JONES, in seconding the motion, remarked that the point of the Company's progress which would appeal to British gas shareholders was the enormous increase in their operations. The Chairman had explained that this had arisen from the extended use of gas for heating purposes, which was precisely what the companies at home were aiming so strongly to obtain, and in which they were very successful. There had been some 45 miles of mains laid during the year, and a considerable length had been enlarged and repaired; so that the whole extension of the Company's business must be regarded as something in excess of the 45 miles. This sort of thing called for capital; and therefore the terms of the Chairman's last remarks about the issue of further capital would meet the views of all the shareholders.

Moved by the CHAIRMAN, and seconded by Mr. C. P. OGILVIE, the scheme for the appropriation of the profits (including a final dividend of 4s. 6d. per share, less income-tax, making 8 per cent. for the year), as referred to by the Chairman in his speech, was agreed to.

Proposed by Mr. JONES, and seconded by Mr. J. M. TULLOCH, the Chairman was re-elected to his seat at the Board. Then the re-election of Mr. C. P. Ogilvie was moved by the CHAIRMAN, and was seconded by Mr. ROSS PINSENT. This having been agreed to, Mr. Ross Pinsent was also re-elected on the motion of the CHAIRMAN, seconded by Mr. F. C. IM THURN.

The Auditors (Messrs. Touche and Co.) having been re-elected,

The CHAIRMAN said he had already referred to the good work done by the Local Committee and the General Manager in Buenos Ayres during the year; and he wished the shareholders to join the Board in a cordial vote of thanks to them, and to the staff of the Company there and in London. Of course, in the bad times they had been passing through the last year or two, the worries and anxieties of the staff had perhaps been greater than in good times. When he told the shareholders that they had to send out every month in Buenos Ayres more than 120,000 accounts, and had then to collect them, they would understand that it was a very large business, with an enormous amount of detail work, with which they had to deal. The Board had the greatest confidence in the Company's General Manager (Mr. Angus), who had had to work very hard during the year. The Auditors told them that the accounts as sent from Buenos Ayres were admirably drawn up, and that everything was quite to their satisfaction. For this, their gratitude was due to the Chief Accountant (Mr. Wilson). With regard to the London Office, he (the Chairman) was there every day, and could testify to the satisfactory work which was done.

Mr. W. H. SKEEL seconded the motion; and it was heartily adopted.

Moved by Mr. C. J. HOLLIS, and seconded by Mr. J. E. DRIVER, a cordial vote of thanks was passed to the Chairman and Directors.

Reduction in Price at Kirkby Lonsdale.—The Directors of the Kirkby Lonsdale Gas Company have decided to reduce the price of gas to ordinary consumers, from the 1st inst., from 4s. 9d. to 4s. 6d. per 1000 cubic feet, and also to make a concession to the users of prepayment meters.

A BONUS FOR MR. ISAAC CARR.

The Widnes Town Council have agreed to a recommendation by the Gas and Water Committee that, having regard to the valuable and efficient services rendered by Mr. Isaac Carr, the Engineer, in connection with the designing and carrying out of certain works, he be allowed and paid out of the gas-works fund a bonus equivalent to 2½ per cent. on the capital expenditure of £36,000—viz., £900.

The Chairman of the Committee (Alderman H. S. Timmis) said the recommendation was a plain business proposal put before business men. Some time ago, the Engineer told them that he must have the works increased or he could not guarantee sufficient gas in the winter months. His plans were agreed to, and the work was put in hand. It was customary in engineering work to call in the advice of an expert; but in this case they had the fullest confidence in their Engineer to make the improvements. They were of the most up-to-date character; and the Engineer prophesied that he could save £8000 per annum. This statement had been more than borne out; for in actual cost alone they had saved £12,000. They had adopted a system of gas production which was not in any other works in the kingdom; and when the success of the venture was known, the system would be adopted by other gas concerns. Taking the factor of gas produced, the Widnes Engineer was the worst paid engineer in the British Isles, and the worst paid man in Widnes for what he did.

The Committee's proposition having been duly seconded, Mr. Turton moved, as an amendment, that it be referred back for three months. This was supported by Mr. Garghan, who said the matter had been sprung upon the Council, who had not had time to see if the works were giving satisfaction. The amendment, however, was lost.

The Ex-Mayor pointed out that while the Engineer stated that he believed that an increased profit of £8000 would be the result of the expenditure of the £36,000, when the figures were handed to the Committee they showed a sum very largely in excess of this amount. As a fact the profits showed a very material increase on previous years. Last year they were £5296, while in March this year, after only between four and five months' work, they were £8100. Based upon these figures, they would have a profit of something like £10,000 or £12,000 more. He thought that the Council would agree with him that the Engineer was entitled to proper acknowledgment. After some discussion, Alderman Timmis replied to the point raised. He said it had been stated that during some of the time the extension was in progress Mr. Carr was away; but he was absent on Corporation business, and the work went on as usual. For months before it commenced there was the getting out of specifications and plans, all of which was done at the gas-works. Mr. Carr gave up the whole of his private practice to devote himself to this work for a period of fifteen or eighteen months; and for this reason he was out of pocket. The Mayor (Mr. D. Lewis), in closing the discussion, said members of the Council were most dogmatic in their criticisms of the gas business, and on matters affecting the Gas Engineer, they were not so well informed as they should be. He was very sorry that they should take up this attitude, and not remember that there were things in regard to this important undertaking which they did not know. He always felt—and he spoke with some sense of his responsibility—that remarks on matters connected with the gas business, and particularly when the Engineer was involved, were not free from animus. They expected the Engineer to be abreast of all that was going on in the gas profession, and to utilize all the experience and knowledge he acquired. The Chairman of the Committee had stated that the Engineer had made a venture which, had it not been successful, would have been very serious for his reputation; and it was surely something to his credit that the innovation had been successful. He considered that by the genius and masterly management of their Engineer, assisted by any fortuitous circumstances which might have surrounded him, he had guided the remodelling of the gas-works so that a saving of £12,000 a year was being effected. He thought the consumers would look at this £12,000 more than at the 2½ per cent. bonus.

A vote was then taken, and the recommendation was agreed to by twelve votes to five—the latter being those of the labour members.

Referring to the preceding matter, the "Widnes Weekly News" last Friday said: Those of the Widnes public who are able to look upon the matter with the calculating business eye will readily endorse the action of the Town Council on Tuesday in regard to the Gas Engineer. In the language of the mart, Widnes town made a "good deal" when it secured an engineer who was his own expert, who needed no props when extraordinary jobs were on hand, and who knows his profession from foundation to coping-stone. The result is a saving at the gas-works of £12,000 each year—a result which any business man, Alderman Timmis included, would be pleased to recognize with a 2½ per cent. bonus every year if the essential man could be found. It is the fact that Mr. Carr's ability has saved £900 in avoiding the engagement of a consulting engineer, together with the huge reduction in the cost of manufacture, which will appeal to the good sense of the ordinary man. In face of this, it was not surprising that the attack of the minority lacked force. The whole field was ranged for material, and finally the opposition lost itself in a maze of irrelevancies. The Mayor's strictures on the flagrant hostility with which the Engineer's work is discussed were long overdue. The animus always proceeds from one quarter, and appears to argue: If you can't say a harmful word, never say a good one. While this spirit obtains, the intentions of the "Labour" section in regard to the gas-works will always be suspect; and they also materially reduce their chances of ever remedying honest grievances.

Mossley Gas Undertaking.—At the last meeting of the Mossley Town Council, it was unanimously agreed that the "Town Clerk is to inform the Saddleworth District Council that the Gas Committee are prepared to allow the Council to become joint owners of the gas undertaking in Mossley and Saddleworth, provided terms of purchase can hereafter be arranged."

PORTSMOUTH TOWN COUNCIL AND THE GAS COMPANY.

The suggestion that the Portsmouth Corporation should municipalize the Portsea Island Gas Company received a decided set-back from a report on the subject by the Borough Accountant and Treasurer. He has examined the proposal strictly from the financial side; and this is what he finds: "That under the most favourable conditions the ratepayers would have to pay £12,544 a year for forty years, the equivalent of a 3d. rate, solely for the privilege of owning the gas-works, and with no prospect of any substantial reduction in the price of gas." It was also thought that the purchase would stop the tendency to continue the healthy rivalry between gas and the electricity works owned by the Corporation. If the transfer were effected, this active competition would cease, to the detriment of all parties concerned, or it would be intensified at ruinous cost to the ratepayers.

Last Tuesday, the Town Council, acting on a report from the Finance Committee, vetoed any further consideration as to the purchase, which, it was stated, would involve an expenditure of public money approaching a million sterling.

A SUCCESSFUL YEAR AT MACCLESFIELD.

Mr. William Newbigging's Resignation.

A report was submitted by the Borough Accountant at a meeting of the Macclesfield Corporation Gas Committee last Wednesday, showing that the net profit on the gas undertaking for the twelve months ended March 31 last amounted to £5953. As compared with the preceding year, this represents a falling off of only £371, in spite of the fact that coal cost £1600 more, and the receipts from coke were £560 less. Of the profit, £2000 will be applied to the maintenance fund, and the balance will go to reduce the rates. The Committee decided to place on record their high appreciation of the services rendered by the Gas Engineer (Mr. William Newbigging) in his excellent management of the undertaking during the most difficult year it has experienced, and in his untiring energy and devotion during the recent time of stress and difficulty at the works.

Mr. Newbigging stated that the vertical retorts had now been completed, and were working exceedingly satisfactorily; and he had taken them over from the contractors. He also intimated that his resignation (foreshadowed some time ago) must now take place at the earliest convenient date. This decision, he explained, was irrevocable.

The matter of Mr. Newbigging's resignation is commented upon as follows by the "Macclesfield Times:"—

"The most notable feature of Wednesday's meeting was the announcement by Mr. Newbigging of his firm resolve to terminate his engagement with the Gas Committee at as early a date as possible. Needless to say, the intimation, which was plainly stated to be final, was received with unaffected regret by every member of the Committee. Mr. Newbigging's present position is that of Gas Engineer; the duties of Works Manager being carried out by Mr. H. Crossland under his direction. The arrangement was made eighteen months ago, when Mr. Newbigging, owing to the many professional claims upon his time, sought relief from the less responsible routine duties of management. An agreement was entered into for three years; and one of its conditions is that, in the event of Mr. Newbigging relinquishing his appointment, the position of Works Manager shall be vacant also, so that the Corporation will be free (as in the past) to appoint one official to serve both as Engineer and Manager. The agreement has still eighteen months to run; but in face of Mr. Newbigging's statement on Wednesday that the condition of his health is one of the principal reasons why he desires to be relieved, there is little doubt that a change will be seen in gas-works management during the course of the next few months. The subject is to be discussed fully at the next meeting of the Gas Committee a month hence. Mr. William Newbigging is the third member of his family who has had charge of the Macclesfield Gas-Works, for the reconstruction of which his venerable father, Mr. Thomas Newbigging, acted as Consulting Engineer many years ago. The first of the trio was Mr. J. G. Newbigging, who left Macclesfield to become Chief Engineer of the Manchester Corporation gas undertaking—a position he still occupies with conspicuous success. He was succeeded by his youngest brother, the late Mr. Ernest Newbigging; and at his death, followed Mr. William Newbigging. Under the direction of the present Engineer, the Macclesfield Gas-Works have reached the high-water mark of financial success; and now that the vertical retorts are working satisfactorily, they are also among the most up-to-date in the country. His services have been a valuable asset to the town; and the Corporation will part with them with great reluctance and regret."

Londonderry Electric Light Charges.—At a meeting of the Londonderry Corporation for the striking of the annual rates, Alderman O'Doherty said the average cost for lighting in the city should be about £2000, but as a matter of fact, the figure was £4637, which was due to the absurd system of estimating so much per lamp for electric light. He contended that the electric light was not value for anything like the money they were paying for it.

Proposed New Gas Tariff at Blackpool.—At a special meeting of the Blackpool Gas Committee, it was decided to recommend to the General Purposes Committee that a differential tariff, by which it is proposed to reduce the price to the larger consumers, be adopted. According to a report of the Gas Engineer (Mr. W. Chew), it was shown that two-thirds of the gas is consumed by one-third of the consumers of under 5000 cubic feet a quarter. At this rate, the consumption does not repay capital charges; and it is for this reason that the new differential rate is recommended. It will come into operation after the consumption of 5000 cubic feet in a quarter; and there will be a graduated scale.

LONDON ELECTRICITY SUPPLY.

Report by Experts.

Acting on instructions of the London County Council Special Committee on Electricity Supply, Messrs. Merz and M'Lellan have investigated the present position and future development of electricity supply in London; and they have prepared a report, which was issued last week. After referring briefly to the causes of the present position, they deal with the best means of securing greater efficiency in future, both as regards the production and distribution of electrical energy. The report does not deal with questions of general policy, or with the arguments for and against the different forms of control, except in so far as these affect the technical and commercial aspects of the problem. It is pointed out that, until the Council have settled the policy to be adopted, it is not feasible to forecast accurately the position at any given future date. Whatever form of control be adopted, the experts recommend the establishment of a new undertaking to carry out the technical changes which they show to be necessary, and to bring about the ultimate amalgamation of existing undertakings, as far as possible without compulsory powers or competition. Appendices which are attached set forth statistics relating to the present undertakings in London and certain leading cities abroad. Portions of the report [which in its complete form occupies nearly sixty pages of print] are reproduced.

The Present Position.

That the present position of electrical supply in London is unsatisfactory scarcely needs proof.* The numerous inquiries held and the evidence given before various tribunals, the statistics of the existing undertakings, and, in fact, the appointment of your Committee, all point to the same fact. But the most unsatisfactory feature of the present situation is that it shows no signs of developing into a better. On the contrary, since the London County Council first considered the question of bulk supply, there has been a serious increase, instead of a decrease, in the number of electrical authorities and generating stations in Greater London; and while the output has grown, the fall in the cost of production has not corresponded with what has taken place elsewhere.

The fundamental cause of the existing state of affairs in London is to be traced to the action of Parliament. Alike in connection with railways, water, gas, and electric light, Parliament formerly encouraged the formation of small rather than large and more efficient undertakings. In the two latter cases, the areas of supply were, in fact, determined by local government boundaries often settled centuries ago, instead of by distribution of population and industries. As regards London, the constituent districts have always been looked at rather than the Metropolis as a whole. In the case of undertakings belonging to companies—such as railways, and gas supply in London—the greater flexibility of private ownership has in many cases enabled amalgamation of the smaller undertakings to be made subsequently, and hence greater efficiency to be secured. Such a policy has hardly ever proved possible among municipal undertakings, and has been forbidden to the London Electric Light Companies.

Competition and Monopoly.

A further cause of the present position is to be found in the measures first adopted by Parliament to protect the public in undertakings of this kind. The belief in competition as the best safeguard was formerly the keynote of parliamentary policy in relation to railways, gas, and other public undertakings. In the case of gas, however, its impracticability was realized many years ago and "districting" was sanctioned; a sliding-scale of price and dividend, "auction clauses," and other devices, being substituted for competition. Of these, the sliding-scale has proved a specially efficient protection for the public. As regards railways, both here and in America the wastefulness of competition is now leading to the adoption of other methods for protecting the public interest.

When electric lighting began, however, competition, in spite of the experience with gas, was still in favour, and was enforced among the London Companies. A maximum price was also fixed in all Provisional Orders granted in London. But it was hoped that a better safeguard still would be found in municipal operation. Hence the earlier electrical legislation was framed on the basis that local authorities would become the immediate or ultimate owners of all electric light undertakings, as is the tendency in the case of water supply. Experience soon proved, however, that the competition of other forms of light and power is the most powerful factor in reducing prices, and that hence no complete monopoly is possible. But it was not until twenty years later that Parliament changed its policy, and granted to numerous electrical companies in other parts of the kingdom very large areas of supply for bulk and power purposes, covering the districts of many local authorities, and not subject to purchase.

There has thus been a much greater development of municipal electric supply in this country than abroad, where private enterprise, either alone, or in conjunction with the municipality, is almost always employed. About 46 per cent. of the electrical supply of London is provided by municipal undertakings. Many of these, in spite of the limitations of area, have produced results which compare favourably with those of the electric light companies. In this country new developments have undoubtedly been retarded, and many undertakings are to-day saddled with plant already obsolete, but not written off.

While municipal undertakings have suffered more than companies from the rapid changes in the industry, the London Companies are beginning to be hampered by the approach of the date of possible purchase. Both classes of undertakings, moreover, possess plant too small to be very efficient, and stations for the most part badly situated.

Essentials of a New Policy.

In deciding on the best electrical policy for London, two considerations should be paramount. Firstly, the need of treating the Metropolitan area as a whole; and, secondly, the need of bearing in mind the full amount and variety of London's future needs.

Just as the electrical development of London as a whole has suffered from being subordinated to that of smaller areas, so it has also suffered from London's electrical needs as a whole being subordinated to those of lighting. In earlier days this was largely inevitable, as the other uses of electricity were not then developed. None the less, it is impossible for the existing lighting systems to supply all the other future requirements of London. The extent of these requirements should, on a conservative calculation, based on the latest developments in other cities and in certain parts of London, be in the near future more than twenty times the present output of the lighting undertakings. London being the largest urban community in the world, the demand for traction, lighting, and power purposes must naturally be very great; but a still larger field exists in the use of electricity for domestic purposes, such as heating and cooking, if it can be supplied at a sufficiently low price.

Improving the Load Factor.

In order to be able to supply electricity at a price low enough to ensure its adoption for all purposes, it is not sufficient merely to employ the most efficient means of production and distribution. A still greater reduction in the selling price must, and can, be effected by improving the load factor—*i.e.*, by employing the same plant and mains for a longer period each day, and hence producing a greater output with the same capital outlay. As the storage of electricity on a very large scale is impracticable, improvement of load factor has to be effected by increasing the variety of the demands supplied from one system.

The supply of a number of different lighting undertakings from one system, instead of from many, will produce a comparatively small improvement in load factor, because the maximum load—which mainly governs the capital outlay—occurs at about the same period in most of the districts in the London area. The addition of a traction and power load effects further improvement, due to there being throughout the day a larger demand for traction and power than for lighting. But the greatest improvement in load factor—at least, in the near future—will be obtained from the addition of cooking and heating loads, the former of which is also well distributed throughout the year. It is, therefore, important to consider how these loads can be stimulated, not only because they are profitable in themselves, but also because, if developed in the right way, they will have a very important effect in improving the load factor of the whole system.

There are several reasons why the development of electric heating should grow in London more rapidly than in many other capitals, the chief of which is the comparatively small amount of heat usually required in the English climate compared with Germany and America. The amount of heat necessary to warm a building in cities where the external temperature is for considerable periods very low is so great that the only practicable scheme at present is to burn coal or coke on the spot—neither gas nor electricity can compete in cost. In London, however, the average winter temperature being higher, the amount of heat required is much smaller; and, consequently, any difference in cost between electricity and other forms of heating is more often counterbalanced by the convenience, cleanliness, and saving in domestic service resulting from electric heating. The fact that electric heating can be switched on and off at a moment's notice is a further advantage in a country where the variations in temperature are as rapid and frequent as in England, as is shown by the increase in the use of gas-stoves. But the rapidity with which electricity will replace all other forms of heating obviously depends on many circumstances.

Fundamentally, to obtain the highest load factor of general supply involves the use of electricity for as many of the citizens' daily needs as possible, as these obviously do not arise simultaneously. The early morning cooking, transportation to the place of business, the warming or lighting of the workshop or office, the return journey and the evening cooking, heating, and lighting, if all done electrically from one system, would utilize its plant for a large part of the twenty-four hours. This general demand and high load factor, and the advantages of the adoption of electricity for all purposes, can, however, only be obtained if the selling price be reduced below a certain figure; and this can only be done by initiating a new policy at an early date. The present methods of manufacturing electricity in London are too costly to enable either these demands or the traction demand to be fully met by the existing undertakings.

London's Advantages.

The magnitude of the potential demand for electricity is obvious The problem is to produce and supply at the figure necessary to meet it. The conditions in London are such as to make it one of the finest fields for electric supply in the world; and it should have the best and cheapest supply of any great city. Fuel can be delivered on the Lower Thames at a comparatively low figure; the river supplies ample water; the demand is that of the largest and wealthiest city in the world; and the diversity of demand is very great. The economy of distribution mainly depends on the density of the load, which in London is greater than that of any equal area in the world. Finally, London's credit and ability to raise capital are unrivalled.

In spite of these unique advantages, London is worse off than many other great cities, especially as regards its lack of a uniform system. More important still, its chances of obtaining an efficient and properly designed system in the future are, under existing conditions, equally poor. Fortunately, however, the capital already expended upon electrical supply in London, though a large sum, is not large in relation to its ultimate needs. The total annual expenditure upon gas, coal, and electricity considerably exceeds the total capital expenditure upon generating stations. Hence, the amount of money already spent need not prevent the initiation of a policy which will gradually stop the present waste of capital and operating expenditure.

Generation.

There are practically only two ways of effecting important economies in electricity production in London which need be dealt with here: (1) To allow the extension of eight or ten of the best existing stations, and gradually abandon all the others. (2) To aim at the gradual abolition of all the stations in or near the Metropolitan area and the

* In the area under consideration there are 65 authorities (apart from traction undertakings) supplying electricity upon 49 different systems from 70 generating stations containing 585 engines.

concentration of production of electricity for all purposes on sites well outside. The second policy may be supplementary to the first. But in order to take full advantage of either policy, it is also essential that the primary distribution system throughout London should be standardized at an early date, and desirable that the distribution systems generally should be unified as soon as possible.

The arguments urged in favour of alternative (1) are: (*a*) That it would be easier to carry out than a more radical change. (*b*) That it would save in cost of transmission. The arguments urged in favour of alternative (2) are: (*a*) That it would effect a saving in the cost of production more than sufficient to balance the increased cost of transmission. (*b*) That it would allow unlimited room for expansion and for possible bye-product work and similar enterprises. (*c*) That it would gradually remove fuel consumption from London, which process has been begun by the concentration of gas production at Beckton.

Economy of Concentration.

In considering these alternatives, the question arises as to how far increase in the size of electrical generating plant results in economy of production. For the last fifteen or twenty years, it has been generally claimed by one school that the larger the size of generating station the lower the cost of generation. Another school contends that while this is true up to a certain point, there is a limit; this limit being put higher or lower according to the opinion of the engineer making the statement. These views at first sight appear contradictory; but the confusion arises from the way in which the problem is stated. What is true, as a general rule, is to say that it is economical to continue the process of concentration so long as it is possible to do so by increasing the size (and not the number) of the individual generating units.

At the beginning of this century, many engineers seriously talked about stations of 10,000 or 20,000 K.W. being the limit of economy; whereas to-day one would hardly find the most conservative engineer doubting the fact that the cost of generation, including all charges, tended to decrease in plants up to 100,000 K.W. Ten or twelve years ago, in fact, engineers hardly contemplated generating units of more than 5000 K.W., or at most 10,000 K.W.; and as there is no advantage in putting more than (say) ten generating units together, it was true that at that date the limit of size as regards economy was of the order of 100,000 K.W. To-day, however, 25,000 K.W. machines are being used, 30,000 to 40,000 K.W. machines have been developed, and generating units of 50,000 K.W. are in sight. Hence, the limit of size, at least as regards economy, has been raised from generating systems of 100,000 K.W., the figure in 1900, to something like 500,000 K.W. to-day.

Reliability.

Before leaving the question of generation, we would refer to the question of security of supply. This in our view is at least as important as any other question; and we could not recommend any policy which did not provide, if anything, greater reliability, as well as greater economy, than the present system. The supply of London from a large number of generating stations, few of which are connected with each other, is unfavourable to reliability of supply, and is likely to prove increasingly so, besides involving more spare plant.

The abandonment of the existing stations would necessarily be a gradual process; and long before it was completed London would be obtaining its electricity from several different, but interconnected, sources. If concentration be adopted, we should provide for a complete subdivision of all new plant, not only in separate buildings, but also on separate sites situated considerable distances apart, and on both sides of the river. As the economy of concentrating the plant down the river arises from the use of larger units of plant, cheaper coal, and more condensing water, the subdivision of the plant over several sites does not destroy these advantages, provided the size of the unit is not reduced; and as the various plants and feeding centres would all be interconnected, the security of the whole system would be increased.

Conclusions as to Generation.

The result of our investigation into the question of generation is to prove that:

1.—Assuming all the existing generating stations for the supply of light and power in the central area were in the hands of one authority, it would pay that authority to shut them down, sell most of the plant, and generate all the energy they produce on sites down the river.

2.—The saving in working costs* which the existing undertakings in the "central area" could effect by obtaining their current from such a concentrated plant supplying for all purposes, would be not less than 18 per cent, or about £170,000 a year, after allowing for all capital charges on the new plant and mains.

3.—The initial capital outlay required for this purpose, allowing for growth of demand during the next four years, would be between £6,000,000 and £7,000,000.

4.—It is not advisable at the present stage to generate at stations situated at the coalfields.

5.—To supply the general domestic demand from ten model stations on any of the present sites would cost, including capital charges, at least 20 per cent. more than from plant concentrated on sites down the river.

6.—If the comparison be made, not with ten new stations, but on the assumption that the existing plant in the ten best existing stations be re-arranged and utilized to the best advantage, the policy of extending on the existing sites shows to still less advantage.

7.—If the necessary concentration of plant could be effected by extending two or three of the existing stations "below bridge," the saving in the cost of transmission would be outweighed by the disadvantages of such a policy, even on financial grounds.

8.—A policy initiated by the concentration of production on sites down the river is the right one for London, on financial grounds, apart from its other great advantages. Its immediate adoption is essential to economy.

Our conclusions are based upon technical and commercial considerations; but we fully realize the great advantages of removing the combustion of fuel from the central area. It can be shown that the actual financial gain to London which would result from such a change would be much greater than the direct economies.*

Distribution.

The comparison made above refers to the cost of production. The other important item in the selling price is the cost of distribution. Of the £27,000,000 invested in electricity undertakings in Greater London, over one-third is represented by cables and house services. There are at present 49 different systems and pressures of distribution in Greater London, with little, if any, incentive to their reduction. This number might be gradually reduced to about one-third, without any very prohibitive expenditure. But any further reduction would be costly.

Not only does this multiplicity of systems increase the total cost of distribution, but it means that most of them are totally, and the best of them largely, unsuitable for dealing fully with the coming demand. While in several districts the distribution networks are sufficient for meeting the lighting demands for some years to come, in others they will need to be supplemented before long. In nearly all cases, however, the existing networks will be quite unable to cope with the great increase in the demand for power and heat (especially in residential districts) which will result from a general reduction in price. To enable this demand to be supplied at the necessary figure, and electricity to be adopted for all purposes, not only the cost of production, but also the cost of distribution, must be reduced. This can only be done by the introduction throughout London of an alternating current distribution system for dealing especially with the demands other than for lighting.

We have considered designs and made detailed calculations of the various methods of distribution available; and our conclusion is that the present distribution systems in the various districts, instead of being generally extended, should be supplemented as required by a high-pressure three-phase system—transformers being installed at intervals for supplying the consumer at low pressure through distributing cables. Such a system, when laid, would cost at least £10,000,000 less than the extension of the existing direct current networks which would otherwise be necessary in order to meet the general domestic demand. Its adoption would, in addition, result in reducing the total operating expenses of the undertaking by 12 per cent. As, and when, this new network was laid, all additional power, heating, and in some cases lighting would be supplied from it. As the supply given through it would be at a lower price than that from the existing mains, it is obvious that many consumers would also change-over their present installations to it, and it would usually not be necessary to extend the existing distribution systems.

In some districts the existing networks might suffice to supply the heating and power loads also, for a time; but one of the aims of the arrangement proposed would be to encourage in all possible ways the gradual laying down of a standard three-phase network with a view to the ultimate standardization of distribution in London. This might possibly be assisted in some cases by the loan of capital for the purpose from some central authority to existing authorities.

There should, in our opinion, be two systems of distribution standardized for London: (1) A three-phase high-pressure system, as referred to above. This would be laid as the existing systems became loaded-up, and would eventually replace the existing systems entirely in most districts. (2) A 500-volt three-wire D.C. distribution system for lighting, consisting largely of existing networks. This might eventually be done away with in many districts; but where it was wise or economical to retain it, it would be retained.

The standardization of the entire distribution network will necessarily be a gradual process. In the meantime, what is really urgent is the standardization of what may be called the primary distribution system throughout London—that is, of any high-pressure mains laid in the immediate future for the purpose of supplementing or connecting-up existing stations and undertakings. At present such mains are laid at voltages from 2000 to 10,000, and for various periodicities from 40 to 100, and not in the interest of London as a whole, but to meet the immediate needs of particular districts. All new mains could be laid for a standard voltage without very serious additional expense; and steps should be taken at once to bring this about. We find that a frequency of 50 cycles per second is that most suitable for London. This is suitable for lighting, domestic, and motive power supply, and also for conversion to direct current. Incidentally, it is already in use by a considerable number of the undertakings in London.

It is essential to efficiency that production and primary distribution should become concentrated in the hands of one authority. It is important that the secondary distribution should, though of necessity more gradually, become standardized. It is not, however, in our opinion, absolutely essential that the distribution and sale of electricity should be entirely carried out by one authority, at least at first, though such an arrangement would probably bring about the most rapid development. The distribution and supply of water, and to a large extent of gas, are in London in the hands of central bodies. In most great cities both the generation and distribution of electricity, also, are in the hands of one authority; and this may ultimately prove the ideal arrangement in London.

While, in our opinion, the time is ripe for beginning the standardization of distributing methods technically, it is not essential at the moment so completely to unify the commercial side of retail distribution. If there were a number of different bodies using different commercial methods of selling electricity, it would not impede the development of electrical supply as much as if a number of different technical methods were used. It would be necessary, however, to ensure that no restriction was thereby placed on the general adoption of electricity

* This saving, in conjunction with the present sinking funds, would enable the existing generating plant to be written-off by 1931.

* Some recent and careful investigations into this question elsewhere, indicate a possible saving approaching £5 per head of the population per annum.

and the gradual introduction of a uniform price, at least in the central area.

After carefully considering the whole matter, we have come to the conclusion that, having in view the large amount of development work that has been done by both local authorities and companies in London, the most practical arrangement as regards distribution would be one on the following general lines, though, in practice, numerous modifications would doubtless be employed in different districts. Under the scheme suggested: (1) No general extension of the existing networks would take place; but there must, of course, be slight additions and alterations from time to time, as well as connections to new consumers. (2) In a certain number of districts the complete undertaking would be immediately, and in other districts gradually, taken over by some central authority. (3) At any rate in the majority of other cases, a bulk supply would be taken.

Under these conditions, the following would be the best arrangement in connection with the existing and proposed new networks:

Existing Networks—Extensions.—Except in cases where the whole undertaking is acquired by the central authority, house services and short extensions might still be made by the existing authority.

Operation and Maintenance.—The same applies to the operation and maintenance of existing networks.

Sale of Electricity.—In cases where the network was retained by the existing distributors, selling might also be retained by them. In some cases the sale of electricity might be retained by them, even though the network was handed over to the central authority.

New Networks.—As regards the new networks, which we recommend should be laid to supplement the existing networks as these become loaded-up, we think the following should govern the policy adopted:

Design.—This must in all cases be in the hands of the central authority.

Laying.—The actual work of laying, or at least the breaking-up of streets and re-instatement, might be retained by the existing authority, if so desired.

Ownership.—The new network might be in the hands of either the central authority or the existing authority; the other terms of the arrangement being varied accordingly.

Operation and Maintenance.—Except as regards the breaking-up and re-instatement of streets, this would, as a rule, need to be in the hands of the central authority.

House-Services.—Here, again, except possibly for the actual breaking-up of streets, both the laying and the maintenance would usually have to be in the hands of the central authority.

Sale of Electricity.—The sale of electricity to all retail consumers might usually, if desired, be retained by the local distributors, whether they own the network or not.

Ultimately, throughout London, both generation and distribution may be carried out by one organization. In the meantime, it will be necessary, when making arrangements with the different distributors, always to keep in view two points: (1) That nothing be done to hinder the ultimate unification and standardization of distribution in London. (2) That everything be done to reduce the price of electricity to the consumer and to increase its use. A sliding-scale or other means of protecting the consumer should be negotiated for, or insisted on, in any new arrangements that may be made.

METHODS OF EFFECTING UNIFICATION.

The ultimate unification of the supply of electricity in London is essential to its general adoption. To effect this without enormous waste of money in the future, a new policy must be initiated without delay. The more carefully the situation is examined, the more inevitable is this conclusion. Having come to a decision as to the correct technical policy of electrical development for London, there remains the question how to initiate such a policy. Broadly speaking, there are four alternative methods available: (1) Bulk supply. (2) Competition. (3) Amalgamation. (4) Some combination of these alternatives.

Bulk Supply.

Concentration of production, coupled with standardization of primary distribution, though economically sound and important steps in the direction of unification, will obviously not solve the whole problem. They would not even remove the difficulties which the Council will have before them in 1931, though they would certainly reduce them. A bulk supply undertaking might, however, be established by some public authority or company for supplying the existing undertakings. With such an arrangement, no retail supply would be given—*i.e.*, there would be no competition except with those of the existing undertakings which have powers to supply railways and other undertakings in bulk. It would not be very easy to make the adoption of such a bulk supply by the existing undertakings compulsory, though steps might be taken to prevent the extension of existing generating stations. Hence, the growth of such an undertaking would be necessarily slow, the business a somewhat difficult one, and its financial success very doubtful; while it would be some considerable time before the ordinary consumer would obtain any benefit. So far as production alone is concerned, it would, technically speaking, be a step in the right direction. But apart from the standardization of primary distribution, it would leave entirely untouched the distribution side of the problem, which is, at least, of as much importance as generation.

Limited Competition.

If a new undertaking were established by some public authority or company with the right to supply on the usual Power Act terms—*i.e.*, in bulk and for power and heating, but not for lighting—progress would probably be more rapid, both directly, in those districts where competition took place, and indirectly, due to undertakings in other districts being compelled by threats of competition to take a bulk supply. Several proposals on these lines were before Parliament some eight or nine years ago—including one by the Council; and some were nearly successful. In default of some better alternative, it is possible that Parliament would to-day sanction a scheme of this nature. If it were sanctioned, its commercial success would be more rapid if it also included powers to acquire some of the existing undertakings completely—*i.e.*, if it had some means of giving a supply for all purposes, at least in some districts, directly to the consumer.

Unlimited Competition.

If a new and comprehensive undertaking were established, covering the whole of Greater London, with full powers of competing for lighting, heating, and power supply, it is probable that the price of electricity in London would immediately fall, and developments of heating and cooking would be rapid. Apart from a certain waste of existing capital, a scheme of this kind, under proper regulations and control, would offer many advantages in the interests of the consumer. Though no monopoly was granted under the Electric Lighting Acts, yet, in order to compensate the existing companies for this competition, Parliament might postpone the date of purchase, or even give them the right to insist upon being taken over by the new undertaking—thus gradually effecting amalgamation. The municipal undertakings would have to be specially dealt with.

Amalgamation.

The most rapid and certain method of bringing about the concentration of production and the unification of distribution, both of which we have shown to be necessary to the general adoption of electricity, would be the complete amalgamation of all the existing undertakings. There are two different policies which have been followed in the past in cases of this kind. Amalgamation of public undertakings (leaving aside the question of subsequent operation) has in some cases been carried out by public authorities and in some cases by private enterprise, more or less controlled. Each method has its own special drawbacks and advantages as regards the public interest.

The numerous amalgamations of water, gas, tramways, docks, and other public undertakings, all tend to show that the principal drawbacks arising from the amalgamation of private undertakings being carried out by public authorities are: Firstly, the costliness of the process, especially if there are many separate arbitrations, as would here be the case; and, secondly, the excessive price which apparently, and to a large extently actually, has to be paid. This applies whether the purchase be compulsory, as in the case of the Water Board, or by agreement, as in the case of the London Docks. Although the shareholder at the time of purchase, being seldom the original shareholder, may make no excessive profit on his investment, the total cost to the community is apt largely to exceed the original cost of the undertaking. But unless an injustice is to be done, there is no alternative but to pay the price. This excessive increment is to some extent avoided where the purchase terms of the whole undertaking are clearly fixed at the time of granting the concession, and is usually reduced where the amalgamation of its component parts has been brought about (prior to acquisition by the public authority), as has been done in the case of the telephones and many of the gas and underground railway undertakings in London.

In the case of the London Electric Light Companies, the terms of purchase in 1931 were fixed at the outset (but no one can say how they will be interpreted); while the right of combination was forbidden in the supposed interests of the consumer. But if further combination among these undertakings (apart from the powers merely to make working agreements granted by the Act of 1908) be deferred until 1931, it would, besides many other drawbacks, have the effect of increasing the amount, and seriously depreciating the value of what the Council can buy in 1931, because the stations and plant, though "suitable for the purposes of the undertaking" in law, will not then be so in fact. Some policy which included the gradual amalgamation of the existing undertakings is the one which is at the same time that best calculated to bring about the technical changes recommended.

Conclusion Arrived at.

After very carefully considering the position of electric supply in London in all its aspects and the various possible alternatives, we have come to the conclusion that the best, and, in fact, the only complete and satisfactory, solution is the establishment of a new undertaking with such powers as will enable it to concentrate production, standardize and unify distribution, and bring about the amalgamation of the various undertakings. We recommend this as opposed to the establishment of an undertaking prohibited from "associating" with, or from competing against, the existing undertakings, provided their co-operation can be secured. This policy does not necessarily involve immediate interference with the Council's rights of purchase in 1931.

Alternative Agencies for Establishing a New Undertaking.

Assuming, therefore, the necessity of establishing a new undertaking to effect these results, we will now consider the alternative agencies by which this might be carried out. Broadly speaking, there are four different agencies by which the new undertaking might be established: (*a*) A combination of all the companies and local authorities in Greater London. (*b*) A new company, formed either by the existing companies or independently. (*c*) A new public authority representing the County and, possibly, certain districts outside, acting alone. (*d*) A new public authority, of this nature, acting in co-operation with private enterprise.

Combination of all Existing Authorities.

This method may be briefly dismissed. It is now nearly nine years since the advantages of concentration and the need for unification were established to the satisfaction of both Houses of Parliament and of several borough councils and companies. In the intervening period, though some attempts have been made, no serious change in the position has been brought about, and no real advance has been made towards the desired end. The history of these attempts seems to indicate that only by the action of some large central body can unification be achieved.

Combination of Existing London Companies.

If private enterprise be the agency decided upon, a company formed under the auspices of the existing undertakings would appear more likely to succeed. Before considering any scheme of this kind, it seems to us essential that the Council should satisfy itself upon certain

important points. As electric light companies have, as a rule, no power to transfer their undertakings, and as the powers conferred upon the London Companies by the London Electric Supply Act of 1908 merely authorize working agreements, and not amalgamation, a holding company would have to be formed. If the existing companies were to form a holding company to erect one or more large stations outside London, and to use such stations for the purpose of supplying undertakings both in and around London, the present powers of purchase would not apply to all of it, and the future cost of acquiring by any public authority might be very seriously increased, especially if the obsolete stations and plant were left standing. In fact, London might find itself in the position of Paris recently, which discovered, when the time for re-purchase arrived, that the companies had the right to retain certain important parts of the undertakings, for which they demanded a high price.

Granted that these safeguards and other points could be satisfactorily arranged, we consider the establishment of the new undertaking by a combination of the existing companies worth consideration. Whether such a combination were granted independent powers or acted as the agent of some central public authority, it would in any case form a useful nucleus for a new organization.

Independent New Company.

If private enterprise be the agency decided upon, and if the existing companies are not able to come to any agreement, or are otherwise unable to put forward a satisfactory proposal, the employment of some independent company, specially promoted for the purpose of establishing the new undertaking, might be considered.

Public Authority Alone.

If a public authority be decided upon as the most suitable agency, the restriction of area from which municipal undertakings have suffered would not apply to a comprehensive scheme covering Greater London. This area is large enough for maximum efficiency.

The advantages of a complete municipal undertaking for London may be stated as:

1.—All questions of control or repurchase of the undertaking are avoided.
2.—The capital would be raised at the cheapest rate.
3.—Any profits that were made would go to the consumer or ratepayer.
4.—Certain municipal electric lighting undertakings are to-day showing considerable enterprise in connection with the commercial side of their business, and are achieving results which compare very favourably with those of the London Electric Lighting Companies.

The disadvantages of such a scheme may be stated as:

1.—Compulsory purchase of existing undertakings would probably be necessary; and this would be most expensive, involving excessive costs of arbitration, payments for goodwill, &c.
2.—The encouragement or establishment of bye-product developments and subsidiary industries in connection with the generation of electricity would be difficult.

The fact that Parliament has hitherto seen fit to place most bulk undertakings in the hands of companies, and to refuse local authorities the right of purchase, is, in view of the unique conditions of London, no conclusive argument against it.

The operation of all electricity supply in London by a public authority would, of course, mean a great increase in the number of municipal employees.

Municipal Ownership and Control—Private Operation.

There is, however, a third course. This is partial or complete municipal ownership with private operation, under strict municipal control; the bulk of the profits going to the public, whether ratepayer or consumer. This co-operative method is the solution now being adopted in one form or another in many large cities abroad, in cases where complete private ownership is not thought satisfactory, and it offers some important advantages.

Apart from all questions of the relative efficiency of municipal and private management, the merits of such co-operative arrangements, compared with absolute company ownership, are that the risk of watered capital with its attendant evils is avoided. The municipality obtains a share in the profits without, or with only small, accompanying risk; and during the concession it is able to exercise closer control over the working in the public interest, and at the termination can assume possession without having to pay for wasted capital, goodwill, or prospective profits. There is also little difficulty in preventing the inefficient operation and maintenance of the plant during the closing years of the concession, as there is not the usual difficulty of raising capital during this period, nor the same inducement to "starve" maintenance. As compared with municipal operation, the advantages claimed by its supporters are that commercial considerations are less likely to be violated for political ends, and that continuity of policy is more certain; while in the case of electricity supply there is the all-important advantage of greater elasticity in development, greater ease in negotiating contracts, and greater freedom in replacing antiquated plant.

The municipal authorities in Paris and Berlin are arranging for the operation of their electric supply entirely by companies—the city sharing in the profits, as is also done in Chicago and other American cities. The co-operative method is being increasingly employed for electric supply purposes by the cities of Germany. It has also been adopted in connection with underground railways in Paris, Hamburg, New York, Boston, and other places. In some cases the whole of the "fixed" capital is found by the city, in some the bulk of the capital, and in others the municipality is merely one of the shareholders. None of these arrangements is, we believe, in force on any large scale in this country, in connection with electricity supply; but the arrangements by which the Indian railways are built and managed by companies for the Government may be cited as an important example.

In view of the marked success of these co-operative arrangements elsewhere, there would appear many advantages, and no insuperable difficulty, in applying the principle to the laying down of a system of electricity supply in the London area, and in making the necessary subdivision of the work between the parts more suitable for the investment of municipal funds and the portions which it would be desirable should be found from private sources. If this were carefully done from the outset, there would be little difficulty when the time came for resuming complete municipal possession.

Such an arrangement would involve: (*a*) An owning and controlling authority, which would supply the bulk of the capital necessary to construct the new works. (*b*) An operating body, which would work the undertaking on behalf of the controlling authority, guarantee the interest on the capital, and gradually unify and ultimately amalgamate the existing undertakings as the agent, and under the control, of the owning authority, and special statutory regulations with regard to price and dividends, &c.

The operating body would preferably represent the interests of the existing London companies, although not necessarily these interests solely. In the event of the existing companies being unable or unwilling to combine for the purpose, a new company might be established for the purpose of acting as the operating agent of the controlling authority.

Controlling Body.

Whichever of the alternatives be adopted for carrying out the unification of electric supply in London, the constitution of the controlling body is obviously of great importance. The discussion of this question is outside the scope of the report; but we might point out that the best results would be secured if the constitution of the controlling authority were to some extent based upon the functions which it would be called upon to perform. In view of the desirability of including an area outside the county, as recommended by the Select Committee in 1906, the co-operation of certain other authorities with the London County Council may be considered desirable.

Recommendation.

Whichever of the alternative methods of carrying out the technical changes discussed in this report be adopted, the first step involves the obtaining of parliamentary powers. We therefore recommend that the London County Council should promote a Bill in the next session of Parliament empowering some central body to set up an undertaking with powers of bulk supply, and the means of gradually acquiring and amalgamating the different undertakings on commercial terms. We consider that in no other way will it be possible for London to obtain the full advantages of cheap electricity, and, moreover, that such an undertaking, if carried out on proper lines, might be made self-supporting at a comparatively early stage.

SUMMARY OF CONCLUSIONS.

The conclusions we have arrived at as a result of our investigations may be summarized as follows:

1.—The concentration of generating plant on sites down the river is the correct policy to begin with, both on technical and commercial grounds, deferring the question of generating part of the energy at the coalfields or elsewhere until both the load and the load factor have grown.
2.—In order to carry out this policy with the minimum waste of capital, a high voltage three-phase primary distribution system at 50 cycles per second should be standardized for London as soon as possible. In this connection, a standard primary voltage should be at once adopted for all new high-pressure mains.
3.—If electricity is to be supplied for power and general domestic use at the lowest possible price, it is also necessary, both for economical and other reasons, that the existing low-pressure distribution networks should, as a rule, not be extended, but be supplemented by a new three-phase network.
4.—The most satisfactory and economical method of achieving these results is the establishment of a new undertaking with such powers as will enable it gradually to concentrate production, standardize distribution, and bring about the amalgamation of all the various undertakings.

ROCHDALE MUNICIPAL UNDERTAKINGS.

Upon the result of the year's working of the Rochdale Corporation Gas-Works depends the question of whether or not the local rates are to be raised; and these figures are expected to be available this week. The present rate is 8s.; but it is "talked up" to 8s. 4d. In the meantime, the electricity accounts show a deficit of £330 for the last twelve months, as against last year's profit of £2882. This is attributed to large extensions, increased cost of coal, and extra working expenses; but the contrast with the profits recorded for previous years is rather striking.

The Water-Works Department continues to be a charge upon the rates, but to a less extent than last year. The deficiency to be made up out of rates this year is £3382, as compared with £4832. At their monthly meeting, the Water Committee received the result of the year's working with gratification. The smaller water deficit and the larger tramway surplus together just balance the disappearance of a subsidy from the Electricity Department.

The situation, therefore, depends upon the Gas Department. Last year £16,000 was allocated to rates; but in view of the higher price of coal and oil, and the fact that there is no corresponding increase of income from residuals, it is anticipated that the profits will be less than last year, when they reached the record figure of £23,654.

Accrington Gas and Water Board.—The Accrington District Gas and Water Board have had before them applications for increases of salary from the office staff, inspectors, and collectors; and they have decided to grant advances at the rate of 5 per cent. to all employees in this category, excepting those who received an advance the previous year. The Board also decided to increase the salary of Mr. Charles Harrison (the General Manager) from £625 to £675 per annum.

THE BLACKBURN STRIKE SETTLEMENT.

At a Meeting of the Lancashire Executive Council of the Gas Workers' Union, dissatisfaction was expressed at the attitude of the Blackburn Corporation in regard to the recent strike. Mr. J. R. Clynes, M.P., the District Secretary of the Union, in reviewing the agreement arrived at between the men's officials and the Corporation, said he had no hesitation in asserting that the Corporation had not fully observed the conditions laid down, nor had they acted in the spirit clearly indicated when the agreement was signed. It was reported that there were still about eighteen men unemployed; and the Secretary was instructed to write further to the authorities and seek an interview on the question with the Corporation Strike Committee.

THE STRIKE AT FLETCHER, RUSSELL, AND CO.'S.

There were further developments last Thursday in the strike at Messrs. Fletcher, Russell, and Co.'s Warrington works; the firm issuing a manifesto, to which the men replied. The men were formerly fighting for the recognition of their various Unions; and having succeeded on this point, they are now fighting for reinstatement. The manifesto which the firm issued stated that, if the men were reinstated *en bloc*, a large number of them would be standing idle about the works, because work could not be found for them, and accidents might occur. The idea of the firm was to take on as many men as possible until such time that all could be reinstated. In the men's reply, it was stated that a conference would settle the misunderstandings. If the firm were prepared to offer assurances that all men could return to work, such assurances could be given to the representatives of the men after mutual agreement.

Writing late last week-end, our Manchester Correspondent said there was still no sign of a settlement of the vexed question of reinstatement, and that apparently another deadlock has been reached.

In accordance with a notice issued last week, the firm re-opened the works on Tuesday morning; and it was intimated that men would be required in all departments. Practically the whole of the workmen, to the number of over 900, remained on strike; the Strike Committee having called upon them not to allow their ranks to be split up by returning to work in sections, but to demonstrate, by their refusal to accept a partial settlement, that they were prepared to "return only as they came out—united, organized, and fully recognized." Several men have returned to work; and it is understood that the firm have engaged a number of new hands. The firm have issued a manifesto in connection with the meeting, at which there were present the Mayor, Mr. Russell, and Mr. A. Hutchinson (General Secretary of the Stove Grate, Fender, and Light Metal Workers' Union), on the reinstatement question. In this statement it is reiterated that if the men were reinstated *en bloc* there would be confusion. The arrangement was, it proceeds, that "Over 100 men would be started on the first day of the opening of the works; but Mr. Russell did not wish to bind himself to the exact number, his idea being to take on as many men as we could find work for, and that each day afterwards additional men would be re-started until all the men were employed." The concluding paragraph of the manifesto is apparently not relished by the strikers—"Applications for employment can be made at the lodge."

LURGAN ELECTRIC LIGHTING SCHEME.

Board of Trade Inquiry.

On the resumption on Tuesday last by Mr. G. B. Deane, Board of Trade Inspector, of the inquiry at Lurgan [*ante*, p. 133] into the Lurgan Urban Council's application for a Provisional Order for a loan of £12,000 to provide a municipal electric lighting scheme,

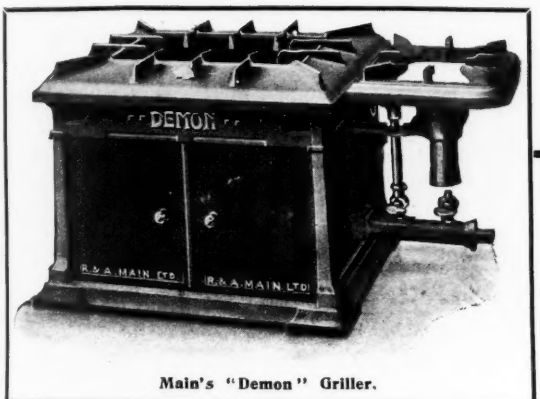
Mr. A. M. Port, a partner of Mr. Walter Pleasance, the Engineer who had formulated the scheme, said he did not see why they should not have in Lurgan a revenue of £2150. He believed the cost of generation would be roughly 1d. per unit, and the cost for capital charges much the same.

Replying to Mr. R. Best, K.C. (for the Lurgan Gaslight and Chemical Company), witness said he believed electricity could be produced in Lurgan for 0·9115d. per unit for an output of 200,000 units, even if in Dublin, for a consumption of 7,500,000 units, the price was 1·31d. per unit. In Dundalk the cost worked out at 1·62d. per unit; but he still held to his estimate of production cost in Lurgan. In Dudley the cost of production was 0·€8d. He admitted, however, that the big traction supply had an effect on cost there. Even acknowledging that the average consumption in 38 centres per consumer was only 378 units, he thought that in Lurgan the average consumption would be 547 units. He based his view on experience. He was convinced that more than 84,000 units would be used for power in Lurgan, and expressed the further opinion that Mr. Malcolm, a Director of the Gas Company, aud owner of one of the largest factories, would use electricity in preference to gas. He based his calculations generally on the assumption that the people of Lurgan were rational.

To Mr. Hanna, K.C. (for ratepayers opposed to the scheme), witness said his estimate only allowed for 3½d. per unit for light for public purposes. It was usual to charge less for public than for other lighting purposes.

Mr. F. W. Pollock (Town Clerk) said there was only one objector at a meeting called to consider the question of opposing the Gas Company's Bill now before Parliament.

Mr. John Mahaffy, J.P. (the Chairman of the Council), said that when



Main's "Demon" Griller.

MAIN'S SMALL SHOT:

ARE you fully provided with small shot for your Summer Campaign? — Grillers, Hotplates, Iron Heaters, Boiling Rings, &c. Main's have a splendid selection of small goods which are novel and useful. Exhibit them in your Showrooms and they will really help.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

the scheme was first broached he was opposed to it; but he was not now. There were strong complaints of the quality and price of the gas at present being supplied.

In reply to Mr. Hanna, witness said he believed the reason that only 165 residents had returned forms in favour of the electric lighting scheme, when it was presupposed that there would have been 250 customers, was that the Electricity Committee had found the task of collecting the forms too laborious. It was not true that his predecessor in the Council chairmanship had been ejected from the position because he had advocated the purchase of the local gas-works. During the last two months, the quality of the gas had improved; but even yet, using flat-flame burners, one could not get more light than from a candle. Gas in Lurgan cost 3s. 10d. per 1000 cubic feet.

Mr. A. W. Mann (another member of the Council) said a private project for introducing electric light had been held over because of the Council refusing permission to erect poles in the streets, and pending the result of this inquiry. Until this private project had been mooted, the Gas Company had made no attempt to deal with the question of supplying electricity, as now proposed by their Parliamentary Bill.

Mr. W. Waite (the Vice-Chairman of the Council) said he did not think it desirable that the Gas Company should secure a monopoly for supplying electric current.

Answering Mr. Best, he denied that the Council had for two or three years been manœuvring to get the Gas Company to sell their works, and said that even if the Council did get the gas-works, it would not do away with the necessity for the electric light.

Later, a witness refused to answer a question put to him by Mr. Best, on the ground that it related to a personal and family affair. A controversy ensued as to Mr. Best's attitude; and, on the Inspector intervening, Mr. Best protested that he was not being allowed to discharge his duty, and decided to leave the room.

Mr. G. M'Ghee (a member of the Council) also objected to being examined on a speech he had made unless the whole speech were read out. Whereupon Mr. Hanna observed that some suggestion had evidently been made to witnesses to answer only what they liked; and, if this course were continued, he, too, would withdraw.

Mr. D. M. Wilson, K.C. (for the Council), said he had not been speaking to the witnesses; and there was no ground whatever for the insinuation.

Mr. Hanna, remarking that a feeling of animosity had been introduced, then withdrew. Returning later, he declined to proceed with his cross-examination, and intimated his intention—having considered matters with his clients—of making a statement next morning.

Extraordinary Development—Gas Company and Ratepayers Withdraw.

When the Inspector sat on Thursday morning, Mr. Hanna said he had received instructions from the Solicitor acting for ratepayers opposing the scheme to state that, in consequence of events on the preceding day, they had resolved to withdraw altogether from the inquiry, and that they proposed to send to the Board of Trade a statement of their reasons for taking this step. Mr. Best said he had also received instructions from the Solicitor on behalf of the Gas Company to withdraw from the inquiry. The Inspector having expressed his regret at the decision arrived at, Messrs. Hanna and Best, with their solicitors and expert witnesses, left the room.

After further evidence had been given, Mr. Wilson urged that the Board of Trade could not, in view of the evidence, refuse to grant the Order asked for. He commented on the Gas Company's refusal of the use of their gas as a stand-by to persons who had the audacity to introduce suction-gas plants. Alluding to the incidents that had led to the withdrawal of the Gas Company's Counsel and Counsel for opposing ratepayers and their witnesses, he described the Council's witnesses as having been "browbeaten and insulted," and said it was an outrage that it should have been insinuated that Mr. Mahaffy had been placed in his office of Chairman on promising to vote for the electric scheme. The suggestion had been repudiated by Mr. Mahaffy; but it had not been withdrawn. The object of badgering the witnesses was to cause the Inspector to intervene, so that the Company could allege they had not had an opportunity of presenting their case.

The Inspector said he agreed that the incidents of the previous day were disgraceful. He felt the "scene" that had occurred very much, and endorsed Mr. Wilson's opinion that "it had been engineered for a purpose."

This concluded the inquiry.

Cowdenbeath Gas Company's Progress.

The output of the Cowdenbeath Gas-Works has been making astonishing growth since the present Company took them over, and they have been managed by Mr. J. B. Scott. From 1,773,700 cubic feet in 1902, the production increased to 40,000,000 feet last year; and further impetus will be given to the consumption by the agreement just entered into, reference to which was made in the "Notes from Scotland" last week. The Dunfermline District Committee have accepted the offer of the Company for the supply of gas to the special lighting district of Aberdour; and the price to be charged will be 5d. per 1000 cubic feet less than was offered by Burntisland—that is to say, 3s. 9d., as against 4s. 2d. For heating halls, churches, &c., the price will be 3s. 4d.; for bakers, restaurants, and trade purposes, 2s. 11d.; and for engines, 2s. 6d. Gas-cookers and similar appliances will be supplied free of charge, as is done in Cowdenbeath. As to street lighting, the arrangement is that the Company are to be paid 29s. 3d. per lamp per season, extending from Aug. 15 to April 15.

Price of Gas at Milnthorpe.—The Directors of the Milnthorpe Gas Company announce that, as from the 1st inst., a uniform price of 4s. 6d per 1000 cubic feet will be charged for gas supplied through ordinary meters for lighting. The price for other purposes will remain at 3s. 9d.

The Modern Gas Fire and Hygienic Efficiency.

"*Gas Fire No. 2.* RENAISSANCE (Richmond Gas Stove Co., Ltd.)—This fire is admirable in design, and, as will be seen, does not show the slightest sign of leakage of combustion products, according to both the shadowgraph and chemical tests, whether it was or was not fitted with a flue or elbow."

THE LANCET, *April 4, 1914.*

Advertisement of THE RICHMOND GAS STOVE & METER CO., Ltd., Warrington & London.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The final meeting of the Scottish Junior Gas Association, Western District, was remarkable for the lecture given by Dr. W. B. Davidson, of Birmingham, who may always be relied upon to have something fresh to tell the gas profession. He very wisely started with advising everyone to make careful records of the returns from not only the gas, but all other products obtained in a gas-works, and to examine these valuations when comparing one carbonizing system or works with another. There is much too little statistical work done in many works, and because the primary object of a gas-works is the manufacture of gas, the value of the residuals is sometimes overlooked. The necessity for large test plants to secure accurate results was also a good warning, as, with the smaller plant which is frequently installed, it is quite impossible to get really accurate estimations of the quantities of tar, ammoniacal liquor, &c., which the coal may contain. Another thing which Dr. Davidson made clear was that, if one or other of the products of the coal is increased, it must be made at the expense of one or more of the others. The claims of some of the makers of apparatus, as well as the managers of works, would try to show that it is possible to get 21 cwt. out of one ton of coal.

The experiences with a single, as against a double, ascension-pipe are what might be expected, as the gas containing the tarry particles, which comes from the coal at the opposite end to the ascension-pipe, must have a longer travel, and a longer contact with the hot sides of the retort, and therefore some of the hydrocarbons will be cracked, and the solid matter left in the retort. The reason given by Dr. Davidson for the improved yield of tar from inclined retorts, as against horizontals with a single ascension-pipe, appears to have some good reason behind it, as, when coal is in a pasty state, the tar may find its way to the lower end of the retorts, and there be distilled and passed up the ascension-pipe, and not cracked by a lengthy passage through the retort. It might be well to remind those who are taking Dr. Davidson's advice regarding the comparison of works or coals, and the price to be credited for each, that the local prices must be taken, and not those which Dr. Davidson gave, because in many of the smaller works the price for tar and liquor are certainly too high, especially where these products are sold jointly, and the fuel price also is on the high side. If, however, the local prices are taken, the suggestion is an admirable one.

The removal of some forty retort-house governors, owing to the deposits of pitch and ammonium chloride causing them to stick, is interesting, and emphasizes the necessity of providing such apparatus with easy means of cleaning. The test in a tank with open top, showing a daily loss of 1¾ per cent. in strength of liquor, at a mean temperature of 50° Fahr., and the fact, which was elicited in the discussion, of the increased evaporation with increased temperature, is interesting, in view of the lower sales in the summer referred to in the recent discussion at the Informal Meeting. The use of deeper tanks to assist in the division of the tar from the ammoniacal liquor is certainly worth recording, as is also the method used at Birmingham for the finding of the depth of tar in tanks which also contain liquor, by means of a rod coated with paraffin before dipping. The great point, however, of the whole lecture was the making of the pitch directly from the gas, by means of the agitator described, by which 90 per cent. of the total pitch in the tar can be immediately obtained without the further labour or heating which has been common in the past, and which cost from 6s. to 7s. per ton of tar. This pitch also has the advantage of containing no ammonium chloride. If the process can be adapted to ordinary systems of gas manufacture, it will assist greatly in the economical production of these residuals.

Mr. J. W. Napier, in the course of his remarks, mentioned the necessity of first obtaining the knowledge of the principles before we can properly practise. Attention cannot be too frequently called to this, because in modern times one frequently finds the suggestion that practical knowledge should come first and principles after, whereas a knowledge of the principles will save a great deal of unnecessary expenditure of time and money on useless experiments.

Kirkcaldy has not yet decided regarding its gas-works. The Gas Committee recommended to the Town Council that the present gas-works should be reconstructed at a final cost of £47,000, and that meantime the first instalment of the scheme, which comes to about £7000, should be started. This includes the removal of the present buildings at Sands Road and School Wynd, the erection of boundary walls, oxide-shed, purifier-house, with purifiers of 30 feet by 25 feet and suitable connections, and the formation of a coke yard. A motion of disapproval of the Committee's recommendation was proposed, and the construction of an entirely new works on a fresh site outside the burgh to cost £70,000 was suggested. The principal point against the reconstruction is that it would not help in the proposed foreshore improvements. After a heated discussion, it was agreed, by 16 votes to 11, to remit the proposal back to the Committee.

The introduction of electric light into several towns in Scotland is still being vigorously pushed by the various undertakers. Galashiels has been offered certain modifications by the Galashiels and District Electric Supply Company, so that the Council might be enabled to give their consent to the Provisional Order being brought forward. In view of the modification of the maximum charges for energy, and a shorter period for the purchase of the undertaking than that prescribed by the Electric Lighting Acts, the Council have now agreed to give their consent to the Order.

The Girvan Town Council have also had an offer of an electric lighting scheme; and the proposal has been remitted to the Finance and Law Committee, after a suggestion had been made by one of the councillors that the Council should take the matter in their own hands.

The Ellon Town Council have just given final instructions for the

THE "ALL-COPPER-ONE-PIECE."

"Spiral-Circulator," with Manhole Closed.

WILSONS' "SPIRAL-CIRCULATOR"

(Patent No. 28996)

TWO COPPER STAMPINGS made one by BRAZING and forming UNLEAKABLE and INDESTRUCTIBLE Water Chamber. NO RUSTING OF WATER. NO FLOOR SPACE OCCUPIED.

(Prices from £4 4s.)

Internally Heated Throughout.
Products travel 5½ feet in heating chamber surrounded by water.

Cleaned Without Disconnection.
Flue, by lifting out the Spiral.
Water Chamber, through the Manhole.

Plan of Inverted Heater looking through flue with Spiral removed.

Spiral which fits into the flue.

Full Descriptive Pamphlets and Prices from

WILSONS & MATHIESONS, LTD.,
Carlton Works, ARMLEY, LEEDS.
London Show-Rooms: 76, Queen Street, Cheapside, E.C.

installation of a public electric light system for the burgh; and the gas-works buildings have been handed over, free of cost, to be used as a power station. It is said that 1268 lights had been guaranteed.

The Macduff Town Council also had communications from a firm of electrical engineers giving the conditions on which they would undertake to introduce electric lighting into the burgh. The matter was remitted to the Lighting Committee.

CURRENT SALES OF GAS PRODUCTS.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 25s. 9d. to 29s. 9d. Pitch, east coast, 37s. to 37s. 3d.; west coast, Manchester, 36s. to 36s. 3d.; Liverpool, 36s. 6d. to 37s.; Clyde, 36s. 3d. to 36s. 6d. Benzol, 90 per cent., naked, North, 10⅜d. to 10⅝d.; 50-90 per cent., naked, North, 10d. to 10⅛d. Toluol, naked, North, 10⅛d. to 11d. Crude naphtha, in bulk, North, 4⅞d. to 5⅛d. Solvent naphtha, naked, North, 9⅞d. to 9⅞d. f.o.b. Heavy naphtha, naked, North, 9d. to 9⅛d. f.o.b. Creosote, in bulk, North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0⅛d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1⅛d. to 1⅜d.; "B" quality, nominally ⅜d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *April* 18.

Since the holidays the tone of this market has hardly been so good, but prices have been fairly well maintained. New business has not been plentiful, but the demand for fulfilling contracts for April delivery has been sufficient to absorb the parcels offered for sale. The nearest values at the close are £12 5s. per ton f.o.b. Hull, £12 6s. 3d. per ton f.o.b. Liverpool, and £12 7s. 6d. per ton f.o.b. Leith. For future delivery no first-hand transactions have been reported this week. Manufacturers continue to quote about £12 per ton at the ports for July-December in equal monthly quantities, but purchasers remain apathetic as regards this period.

Nitrate of Soda.

The price of this article has declined further, and the quotations on spot are at the present time 10s. 3d. per cwt. for ordinary quality, and 10s. 6d. for refined.

From another source it is reported that the market for sulphate of ammonia has been decidedly quiet throughout the past week; and though there is practically no alteration in prices, yet buyers will not come on unless some reduction is made. Outside London, makes are still quoted at £11 10s.; Hull, £12 5s.; Liverpool, £12 6s. 3d.; Leith, £12 7s. 6d.; Middlesbrough, £12 5s.

COAL TRADE REPORT.

Northern Coal Trade.

Now that the trouble in the Yorkshire coal trade has ended, prices are lower in the North, and forward supplies are offered more freely. Best Northumberland steam coals are about 13s. 9d. to 13s. 10½d. per ton f.o.b.; second-class steams are about 13s. per ton; and steam smalls are lower at 7s. to 8s. The output is now again at a normal rate, and is well taken up on the whole. In the gas coal trade, there is also more coal on offer. The consumption is smaller; but there are some contracts now put into the market. Best Durham gas coal is about 13s. 9d. per ton f.o.b.; second-class kinds are 12s. 9d. per ton; and "Wear specials" are 14s. to 14s. 6d. per ton f.o.b. Among the contracts that are concluded are those for 60,000 tons for the Western Gas Company of France. The price is said to be 25 frs. 50 c., delivered at St. Nazaire. Contracts for 100,000 tons of gas coal, over a year, are asked for Königsberg; and it is supposed that there will be competition from German coalowners for these contracts. The coal trade is now settling down after the holidays; and the commencement of work in Yorkshire again will lessen the pressure on pits in the Northumberland and Durham district. Coke is quiet. The lessened production of gas coke should steady prices. Good makes are 12s. to 12s. 6d. per ton f.o.b.

Reduction in Price at Bolton.—The Bolton Gas Committee have decided upon a reduction in the price of gas of 2d. per 1000 cubic feet for domestic supply, and 4d. for power purposes. Hitherto there has been one price for both classes of consumption; but now the rate will be 2s. 5d. per 1000 cubic feet to domestic consumers, and 2s. 3d. to users of gas for industrial purposes.

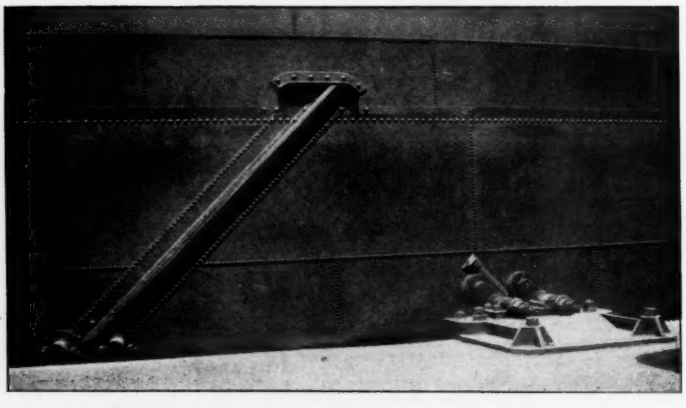
Explosion at Battersea.—Damage was caused to the lower part of Dr. Clanchy's house in Battersea on Saturday morning by a gas explosion; and unfortunately the Doctor, who had gone downstairs to ascertain the cause of a strong smell of gas, was thrown to the ground and injured. He was taken to St. Thomas's Home, and was later stated to be progressing favourably.

Water-Works for Gaza.—A recent number of the "Engineer" contains plans and particulars of the water-works which have been carried out for the supply of Gaza, the second largest town in the recently created province of Behar and Orissa. It is on the direct route between Bombay and Calcutta, 292 miles from the latter city, and its normal population is between 70,000 and 80,000. The scheme was designed by Mr. G. Bransby Williams, M.Inst C.E., the Sanitary Engineer to the Bengal Government, for providing 1½ million gallons of water per day, or 12½ gallons per head for a population of 100,000. This is a generous supply for an Indian provincial town; the majority of the works furnishing only from 6 to 10 gallons per head. There are two reservoirs of reinforced concrete.

"BEARSCOT" SPECIALITIES.

ASSURE STABILITY AND EFFICIENCY.

"THE NEW BEARSCOT TWIN GUIDE-ROLLERS,"



SAFETY STOPS, EXTENDED SHEETS, &c.

When requiring Additional Storage kindly write to:—

R. & J. DEMPSTER, LTD.,

LONDON OFFICE:
165, Gresham House, Old Broad St., E.C.

MANCHESTER.

Road Surfaces and Heavy Motor Traffic.

Feeling that, in view of the great increase in heavy motor traffic, existing macadam roads should give place to a more durable method of construction, Mr. Alfred Dryland (the Surveyor to the Surrey County Council and Consulting Engineer to the Road Board) has investigated the matter, and arrived at the conclusion that the best wearing surface is a dense asphaltic composition. Properly laid, he is of opinion that the life of such a road will be from seven to fourteen years, and that the cost will not much exceed the upkeep of the present macadam surface. To put the matter to a satisfactory test, Mr. Dryland is to treat 26½ miles of main roads in the eastern part of the county with a finished thickness of 3¼ inches of high-class bituminous material, which he will lay with his own plant at a cost of 4s. 6d. per yard complete. The estimated cost of the experiment is £87,972, of which the Road Board will contribute in grants £34,556 and in loans £43,500. Including the repayment of the loans over a period of five years, the cost to the County Council will work out at £57,750, or £655 a year in excess of the cost of the present macadam roads.

Coleraine Gas Undertaking.—The Coleraine Gas Committee reported to the Urban District Council, at their April meeting, that the total gas collection for last year amounted to £3647; the arrears being only £4 14s. 8d. The Council decided to adopt a proposal whereby the work of the stokers will not exceed eight hours per day.

Alliance and Dublin Gas Company and their Employees.—Strained relations arose between the Alliance and Dublin Consumers' Gas Company and their gas-meter collecting staff, in regard to an order by one of the principal officials that collections should proceed on Bank Holidays as on other week-days. Intimation was made that the new order was to come into operation on Good Friday, and was also to apply to Easter Monday; and the sympathy of the Company's employees generally, including the clerks at the chief office, was extended to the men. Strong representations were made to the management on the subject; and the order was withdrawn—at least in so far at it applied to the two days indicated. It is understood that it is not likely to be enforced on future occasions.

Satisfaction at Chard.—A report on the working of the gas undertaking for the year ended March 31, prepared by the Gas Manager (Mr. H. D. Lumb), was submitted at the last meeting of the Chard Town Council. It showed that the quantity of gas sold was 32,418,000 cubic feet, as compared with 29,960,000 feet—or an increase of 8·2 per cent. Alderman Dening (the Chairman of the Gas Committee) alluded with satisfaction to the progress of the undertaking, and said meters were still being put on. He took the opportunity of paying a tribute to the manner in which the works were being managed by Mr. Lumb. In reply to Mr. Turner, who asked how it was that more gas per ton of coal was being made, the Mayor (Alderman E. Gawler) pointed out that it was owing to the different manner in which the coal was being manipulated.

Another "Stellorite" Steel Case.

Our contemporary the "Ironmonger" continues its attacks upon the Stellorite Steel Company; and in the current issue particulars are given of a case in which the Company had a dispute with the Bridport Water Company in regard to an order, the method of obtaining which was much the same as in cases previously reported. It was as follows: A small sample of steel was ordered by a clerk, under the impression that it would cost only a shilling or two. The Company, however, delivered rather more than 2 cwt. of their steel, and sent an invoice for £17 12s. The clerk and the Company's Manager and Secretary (Mr. H. Gordon) both wrote to the Company and explained the circumstances under which the order was given. Thereupon the Company offered to allow a "special and exceptional discount" of 10 per cent., in order to avoid legal disputes and expenses. This was declined, and the bars were returned; but the Company refused to accept them. Mr. Gordon then informed them that the bars remained with the carriers at the Company's risk and cost. This brought a letter pressing for payment, and threatening legal proceedings. These were duly commenced, and the case was fixed for hearing on the 2nd ult.; but it was adjourned until the 6th inst. on the application of the defendants' solicitor. The postponement was opposed by a local solicitor, who made the following offer on behalf of the plaintiffs: The Water Company to accept the steel and pay £14, with £3 5s. towards the costs, or return it and pay £5 towards the expenses and carriage, and £3 3s. costs. The defendants declined to consider either offer, and applied for a jury. On the 13th of March the Stellorite Company's London solicitor made another offer to compromise; suggesting that the defendants should pay £9 to settle the claim, and £3 3s. costs. On the 26th the Company made a still further attempt to compromise the action; this being their fourth concession, including the first offer of a discount. They said they were prepared to withdraw the case and take back the steel; each side paying its own costs. The Water Company's solicitor replied to the effect that, as the defence was an allegation of fraud, his clients could not conscientiously compromise. On the 1st inst. he received a notice from the Stellorite Company's solicitor that they had abandoned their claim; giving as a reason that it was not worth their while to bring witnesses over from Paris.

Gas Prices at Bangor (Co. Down).—The Bangor Urban Council have adopted the following scale of discounts to be allowed to consumers for gas supplied for power and manufacturing purposes: (*a*) 5 per cent. off all accounts paid within one month from dates of furnishing; (*b*) 5 per cent. over and above the 5 per cent. under (*a*) off all accounts amounting during each financial year ending March 31 to £20 and under £50; (*c*) 10 per cent. allowance over and above the 5 per cent. under (*a*) off all accounts amounting during each financial year to £50 and under £100; and (*d*) 17½ per cent. allowance over and above the 5 per cent. under (*a*) off all accounts amounting in each financial year to £100 and upwards.

"VICTOR" GAS BOILERS

No. 41 APPARATUS.

A New Series with Cylinder and Boiler arranged in self-contained form, connected with the necessary flow and return circulating pipes ready for fixing.

Made in three sizes, suitable for Flats and Private Houses having either one or two baths.

This form of "VICTOR" Apparatus embodies the advantages of the separate boiler and storage type, heating the water in small quantities without mixing with the bulk, and being self-contained occupies less space.

It is provided with flanges ready for service pipes, so that the cost of fixing is low.

It can be recommended for general use in new Installations, or when reconstructing existing Apparatus with Cylinder-storage in place of Tank ditto.

THOMAS POTTERTON, Cavendish Works, **Balham, LONDON, S.W.**

Smashing a Prepayment Meter.

At the Thames Police Court, a well-deserved sentence of three months' hard labour was passed on James Bailey, for robbing and damaging a meter belonging to the Commercial Gas Company. It was stated that when Bailey smashed the meter he caused a large escape of gas, and that at the time there were 27 persons in the house, including a number of children. Sergeant Cox gave evidence that when Bailey was charged, he said: "I did it with the leg of a table. I hit the meter, and out went the gas. I have spent the money."

Fatality through a Defective Gas-Tap.—It was stated at an inquiry into the death of Maria Coleman, aged 59, of Wolverhampton, that she was found dead in bed, with the bracket tap turned half on, and the gas unlit. A constable who examined the tap said that it was out of order, and could be turned right round. Just a touch of the finger would turn it on or off. The Coroner remarked that the deceased had probably caught the tap with her finger after turning the gas off. A verdict of "Accidental death" was returned.

Curious Charge of Attempted Arson.—Catherine Pemberton, a boarding-house keeper, was remanded on bail at Eastbourne last Friday, on a charge of maliciously attempting to set fire to a dwelling-house, by causing an escape of gas in the cellar and placing a lighted candle on a shelf opposite. A man was in possession, under a bill of sale; and one evening after defendant had gone out, he went into the cellar and found the gas escape and the lighted candle. Near the hole in the pipe was a screw-driver. Defendant said she could give a full explanation.

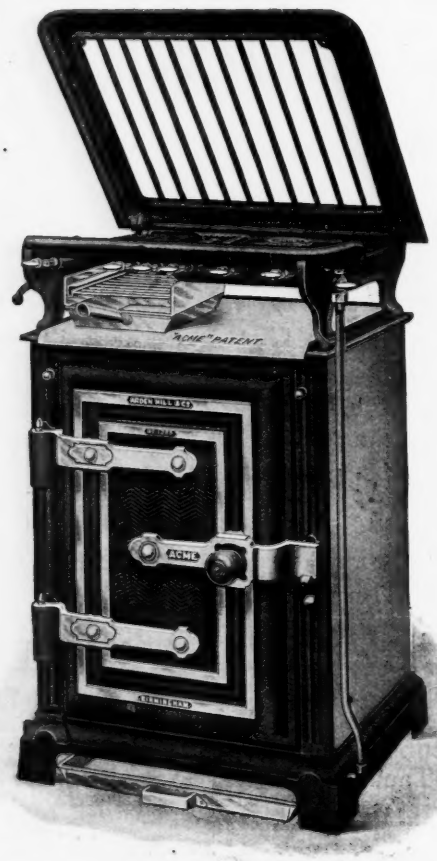
The Deadly Pull-Down Chandelier.—This was the heading of one of the chatty paragraphs by "Bypasser," in the article bearing the title of "Told after Shop Hours," in the "Ironmonger" for the 11th inst. The writer said: "I suppose it is impossible to expect the average householder, particularly if she is a woman, to realize that metal fittings necessarily decay in the course of time. Sometimes this want of understanding has serious consequences. Last week, for instance, in a private house in North London an old lady of ninety-two and her housekeeper were found dead in their bedrooms. The police found that the chandelier in the dining-room was on the floor; the three chains supporting it had simultaneously failed, and gas was issuing from the naked end of the telescopic pipe at full bore. The evidence showed that the elder lady had lived in the house ever since it was built fifty years ago, and that the chandelier was at least forty years old. I believe the Gas Light and Coke Company from time to time issue notices warning householders against the use of these obsolete fittings; but, as long as they continue to serve, householders are inclined to skirk the bother and trouble of renewals. Ironmongers, however, should keep the case in mind and use the opportunities that come along at this time of the year to emphasize the need of substituting something more modern for pull-down chandeliers, where it is found that these fittings are still in use."

Longwood and Slaithwaite Gas Bill.

At a meeting of the Slaithwaite Urban District Council last Thursday, a communication was read which had been received from the Golcar Urban District Council enclosing a petition against the Longwood and Slaithwaite Gas Bill. The letter stated that the Council were opposing the Bill because they were advised, and believed, that the advantages to be secured would be chiefly in the interests of the shareholders of the Gas Companies. They were advised that the standard price should be reduced, and a uniform charge made from the beginning throughout the whole area to be affected by the Bill; and that, if any additional expense be incurred by consumers by the adoption of incandescent burners, consequent on the alteration which would be brought about by the reduction in the illuminating quality of the gas, the expense should be borne by the Company. The Linthwaite Council had passed a resolution expressing sympathy with the action of the Golcar Council, and approving of the petition filed against the Bill. They asked the Slaithwaite Council to pass a similar resolution, if it was found to express the general view of the Council. The Clerk (Mr. E. Gledhill) said that previously it had been decided not to oppose the Bill; but a resolution was carried that the Slaithwaite Council express their sympathy with the action of the Golcar Council.

Cork Water Undertaking.—At a meeting of the Cork Water Committee, the estimate for the year ending in March, 1915, was adopted; the expenditure being stated at £14,162, and the income at £14,077. The public water-rate was agreed to at 3d. in the pound, and the domestic rate at 5d.; the latter being a reduction of 1d. in the pound. In a report submitted by the City Engineer, it was stated that the consumption of water per head per day had fallen to 37 gallons. Some 7 gallons per head per day more, however, would require to be taken off before it could be said that the waste, which had been the subject of widespread complaint, had been reduced to a minimum. It was remarked by members that the City Engineer and his staff deserved congratulation on the improvements made and their results.

Rosario Water Supply.—At the nineteenth ordinary meeting of the Consolidated Water-Works Company of Rosario, Limited, last Thursday, the Chairman (Mr. W. T. Western) said that the undertaking had made during the year 1913 what he thought, considering all the circumstances, the shareholders would regard as satisfactory progress. The number of customers had increased by over 5 per cent.; while the revenue had grown in a somewhat higher ratio. The net revenue was £74,067, as compared with £66,027, or an increase of £8000. If the various appropriations recommended were approved, the Directors would, after paying the preference dividend, be able to make up the dividend on the ordinary shares to 8 per cent. (free of income-tax), to place £10,000 to the reserve and contingency fund, and to carry forward £5000 more than was brought in. The report was adopted.



THE . .

"Super-Acme"
Gas Cooker.

Where other high-grade Cookers end is the starting point of the "Super-Acme." The "Super-Acme" is not another ordinary Cooker; it is the highest point yet reached in high-grade Gas Cooker Construction.

SOME NOTABLE FEATURES.

Extra large oven.

Hinged and improved hotplate; taps in front; wrought-iron top bars.

Porcelain enamelled inside and out.

Nozzle outlet at back, leaving clear space on top of oven for loose enamelled tray.

All parts are standardized and are not nominally but **actually** interchangeable.

ARDEN HILL & CO.,
"Acme" Works,
BIRMINGHAM.

Rochdale Show-Room a Success.—The extent to which the Rochdale Gas Committee's new show-room for cookers, water-heaters, and other appliances, and their policy of fixing apparatus free under certain conditions, have stimulated the use of gas appliances, is attested by the fact that last Wednesday the Committee passed accounts amounting to over £650 for the fitting of stoves, cookers, grillers, heaters, &c. The work of fitting is done by the plumbers as agents for the Corporation.

Automatic Lighting at Molesey.—At the last meeting of the Molesey Urban District Council, the Highways and Lighting Committee reported that the Hampton Court Gas Company were prepared to enter into a contract with the Council to light their district by automatic apparatus, and maintain the public lamps, for a period of ten years. The quotation provides for a total of 3700 hours; and the annual charge for automatically lighting the lamps, fitted with inverted gas-burners, cleaning and maintenance, as under the present contract, will be £2 16s. per annum. The Company agree to a proviso for a sliding-scale of 1s. 2d. per lamp per annum for each 1d. rise or fall in the price of gas charged to private consumers, and to fix the price of gas at 2s. 9d. per 1000 cubic feet as the basis of calculation, should it be considered expedient to alter the hours of lighting. On the Committee's recommendation it was agreed to accept the Company's quotation, and to enter into a contract for the period mentioned.

The Leatherhead Gas Company are inviting tenders for 600 shares of £10 each and £2000 of 4 per cent. debenture stock. The minimum price of issue is £10 per share, and par for the debenture stock.

The Atlas Coke and Patent Fuel Company, Limited, has been registered with a capital of £20,000, in £1 shares, to acquire, construct, and maintain works for carrying on the business of manufacturers of coke, patent fuel, briquettes, &c.

While endeavouring to locate an escape of gas in a house at Ancoats, Arthur Alton struck a match and both he and another man named Chadwick were burned by the explosion which followed. Chadwick was detained in hospital, but Alton was able to return home after treatment.

The Stourbridge Refractories Company, Limited, has been registered with a capital of £25,000, in £1 shares, to get fire-clay and other materials, manufacture and deal in fire-bricks, bricks, artificial stone, &c., and execute an assignment between Thomas Vale and Sons, Limited, and the Company.

Injuries were caused to three employees in the electrical department of the Shoreditch Borough Council, by an explosion in a street box. They had been told off to search for a fault; and on reaching Hoxton Street, they saw smoke issuing from a box. Immediately the lid was lifted, the explosion occurred.

While on his beat in a street at Blackburn a constable noticed a bright light through the cellar window of a clothing and boot stores. He informed the proprietor of the fact, and on entering the cellar it was discovered that an electric wire near a gas-meter had fused. The flames were smothered with a wet cloth.

The tar distillery works of Messrs. Tunstall and Co., between Leeds and Bradford, were destroyed by fire early on Saturday morning. The outbreak occurred in a large shed where roofing material was stored; and, with a wind blowing, the building was destroyed—damage to the extent of many thousands of pounds being done.

During its existence of over a century and a half there had been until last week no record of a fire having broken out in the Mansion House, in the City of London. Early on Wednesday morning the night watchman noticed smoke coming from the floor of a service-room, beneath a gas-heated plate-warming apparatus which had been in use the previous evening. Fortunately the fire was put out before damage had been done to anything but the flooring.

During the strike of coal miners in Yorkshire, the Gas Committee of the Bradford Corporation took the opportunity of drawing the attention of the public to the fact that to users of gas the advance in the prices of coal had no terrors, and of advocating the use of gas appliances. This action, according to a paragraph in the "Ironmonger," was productive of benefit to those engaged in the ironmongery business; and it was pointed out by the writer that "the constantly recurring strikes in the coal and carrying trades are causing an ever-growing tendency in the industrial centres of Yorkshire to rely upon gas or electricity rather than on coal."

Last Wednesday evening was the occasion of the Davis Gas-Stove Company's fifth annual staff dinner, which took place at the Holborn Restaurant. Mr. H. Addis Price, the Chairman of the Company, presided over a gathering of about sixty members of the staff. He was supported by Mr. Harold N. Davis and Mr. Cyril G. Davis. The toast of the firm was proposed by Mr. W. R. Twigg, the Manager of the Technical Department, in a very felicitous speech, in which he touched upon certain extensive operations on which the Directors were about to embark, and urged all his colleagues to give their most energetic co-operation to bring them to a successful issue. After dinner, the company concluded a very enjoyable evening at the Coliseum, as the guests of the Directors.

The Ruislip-Northwood Urban District Council have, subject to the sanction of the Local Government Board being obtained to the raising of the necessary loan, accepted the tender of the Pinner Gas Company for the lighting and maintenance of the street-lamps proposed to be fixed in Northwood, and also for the supply of the necessary lanterns, automatic controllers, and brackets. The Northwood Electric Light and Power Company and the Gas Company sent in tenders. The tender of the Electric Light Company was not altogether in accordance with the specification, as they only tendered for the lamps on the route of their existing mains—namely, 93 in number; whereas the number specified was 116. Their price per lamp per annum was £1 10s. 6d. The tender of the Gas Company was in accordance with the specification; and their price per lamp per annum for lighting and maintenance was £1 5s. 9d.

Hot Water for "Washing Up."

PARKINSON'S "GACYLETTE"

(STORAGE HEATER)

For providing the frequent small quantities of Hot Water for Washing Up and Domestic Requirements.

Extreme Economy of Gas in Heating and Keeping Hot.

Automatic Gas Valve reduces Gas when Heated.

Copper throughout, Tinned inside.

Price - £2 7s. 6d.

Holds about 3 Gallons.

SPECIALLY SUITABLE FOR HIRING OUT.

THE

PARKINSON STOVE CO., Ltd.,

(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM AND LONDON.

Every machine embodies the results of over 45 years' manufacturing experience.

PSC

The Ard-Lyte Syndicate, Limited, has been registered with a capital of £1000, in 4s. shares, to carry on the business of manufacturers of gas burners and fittings and electric light appliances.

The Ryde Borough Council have accepted a tender from the Isle of Wight Electric Light Company for illuminating the new Town Hall at a sum, for fixing, of £39 15s. 9d. for five lamps, and a cost of 8d. per lamp per hour. The Gas Company's tender was £84 for fixing, and 11d. per hour for lighting. The Council also accepted a tender from the Gas Company for lighting and maintaining the public lamps for three years, at a cost of £745 per annum, as against £742 10s. under the previous contract.

Messrs. Samuel Gratrix, Jun. and Bro., Limited, of Manchester, recently entertained the whole of their employees at a tea and concert, in order to celebrate the completion of fifty years' service by Mr. George Brooks, one of the Directors in the Chandelier and Gas-Fitting Department of their business. The employees contributed to make him a present, in token of esteem, of an elegant writing bureau, and to give Mrs. Brooks a gold watch bracelet. When Mr. Brooks entered upon his duties at the old lead mills in Alport Town, Deansgate (which are now covered by the warehouses of the Great Northern Railway), gas-fitting was in its infancy; and during his business life (with the old firm and afterwards with the new Limited Company) he has witnessed amazing developments in gas and electric lighting. He was made a Director of the Company in 1909; and it is with deep regret that his fellow Directors are parting from him because of advancing years.

Last year there were 158 fires in the City; and of these it is stated that sixteen were caused by defective electrical fittings. The Coroner held six "fire inquests," under the Act applicable only to the City. Though this Act is felt to have greatly decreased the number of fires, it has not been adopted in other parts of London or in the Provinces.

As an echo of the late National Gas Exhibition a pleasant function took place at the chief office of the Aldershot Gas, Water, and District Lighting Company last Saturday week. During the run of the exhibition every facility was given to the employees of the Company to visit Shepherd's Bush, and to heighten the interest and value of the opportunity prizes were offered by the General Manager (Mr. R. W. Edwards) for the best written descriptions of the exhibits and their bearing on local practice. The prizes, suitably inscribed, took the form of valuable technical books dealing with various phases of modern gas practice; and Mr. Edwards duly handed them over to the following successful employees: Messrs. J. Green (District Inspector, Aldershot division), W. J. Hubbard (District Inspector, High-Pressure and Maintenance Department), J. W. Gibson (District Inspector, Farnborough division), G. Allen (Meter Testing and Waste Water Department), H. Stiles (General Foreman, Ash Road Gas-Works), H. Cox (a leading gas fitter of the Aldershot Division), H. Adams (a leading gas-fitter of the Fleet Division), G. Hoare (a leading gas-fitter of the Camberley division), and H. Richardson (a junior gas-fitter of the Hartley Wintney division). Additional prizes presented by the Chief Superintendent (Mr. Bell) were won by J. Green and H. Cox.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had a quiet week, the magnificent weather tempting a prolongation of the holidays. The general tendency was not inspiriting, for the leading factors were adverse. The Home Rule question seemed to be no nearer solution, labour unrest was still to the front, the Mexican muddle dragged its slow length along, and the outlook in the Money Market was not encouraging. So business was at low pressure all the time; and all the chief markets show a line of losses at the close. Consols were conspicuous in this respect, showing a reduction of ⅛ in the week. Markets re-opened on Tuesday after the Easter interval with a determination to exhibit a cheerful countenance; but business was so very slack that the semi-stagnation caused markets to give way later. Actual changes were not of considerable magnitude. Consols managed to hold on, and variations in Rails were few and moderate; but American were weaker. On Wednesday apprehension was occasioned by the demonstrations in Tampico Bay, and was aggravated by tightening money. Government issues gave the signal, and the rest followed. Consols fell ⅛ for money and ¼ for the account. Rails were very shy, and prices shrunk. American stocks were quite weak; and the Foreign Market was perturbed. On Thursday the indisposition to deal was most marked, and the weakness was general all round. Government issues of all sorts fell, Consols losing ⅜ for money and for the account. Rails were quite in the cold, and prices dwindled; and Transatlantics found no support. Friday was better. Opinions for the most part were less uneasy in regard to the aspect of important state affairs; and markets were firmer, though extremely inactive. Consols did not change, Rails effected some small advances on balance, Transatlantics looked stronger, and Foreign varied but little either way. Saturday was almost inanimate; the fine weather being provocative of absenteeism. Government issues were moderately firm, and Consols closed without further change at 75⅝ to 75⅝. Elsewhere the tone was rather easier. In the Money Market there was a fair demand, and discount rates stiffened; but the situation eased before the close. Business in the Gas Market was only a moderate handful. But the tone was quite favourable for all classes; and a fair array of advances in quotation was the result. In Gas Light and Coke issues, the ordinary was quiet and firm at unchanged figures; transactions being within the range of 101⅛ to 102¼. In the secured issues, the maximum made 77½ to 79 (a rise of ½), the preference 96¾ and 98 (a rise of 1), and the debenture 74½. South Metropolitan was dealt in at the same figures as the previous week—109½ to 110⅛. In Commercials, the 4 per cent. realized 106⅛ and 107½, and the 3½ per cent. 105. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 63 (a rise of 5), Bournemouth "A" at 29¼ and 29⅜ (a rise of 1¼), ditto "B" at 14¾ and 14⅛, Brentford old at 264 (a rise of 2), South Suburban at 114, ditto preference at 110½, ditto debenture at 114½, and (on the local Exchange) Newcastle at 100—a rise of ¼. In the Continental companies, Imperial marked 172½ to 174, ditto debenture 85¼ (a rise of ½), Union 81½ and 81¾, and European 18 to 18¼. Among the undertakings of the remoter world, Bombay fetched 6½, Ottoman 7 5/16 and 7⅜, Primitiva 6⅜ to 6¾, and ditto preference 5 to 5⅛.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 75⅝—75⅞. Previous week, 76⅛—76⅜.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	63–68*	+5	3 13 6
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	73–81	..	4 12 9
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5
50,000	10	Feb 26	6	Bournemouth Gas & Water B 7 p.c.	29–30	+1½	5 6 8
352,500	10	,,	7	,, Pref. 6 p.c.	14½–15	..	4 18 4
75,000	10	,,	6		13⅝–14	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	260–265	+2	5 5 8
330,000	,,	,,	11	Do. New	204–209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	205–211	..	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	152–157	..	5 1 11
530,000	20	Mar. 26	12½	British	44–45	..	5 11 1
120,000	Stk.	Dec 30	4	Do. 4 p.c. Deb. Stk.	90–92	..	4 7 0
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11
100,000	10	—	—	Cape Town & Dis., Ltd.	1–2	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2½–4½	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73–78	..	5 15 5
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	106½–108½	..	4 12 2
1,513,280	Stk.	Feb 12	5/3/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	6⅜	Do. 3½ p.c. do.	103½–105½	..	5 1 1
475,000	,,	Dec. 11	8	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2
800,000	Stk.	,,	4½	Continental Union, Ltd.	80–83	..	5 8 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	117–122	..	5 14 9
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd.	17½–18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord.	101–103	..	4 14 7
2,600,000	,,	,,	3½	Light 3½ p.c. max.	76–79	+½	4 8 7
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	96–99	+1	4 0 10
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	73–75		4 0 0
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅞–17⅜	..	6 7 6
131,000	Stk.	Mar. 12	7⅜	Ilford A and C	147–150	..	5 1 8
65,780	,,	,,	6⅜	Do. B	115–118	..	5 3 10
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	90–92	+1	4 7 0
4,940,000	Stk.	Nov. 13	9	Imperial Continental	172–177	..	5 1 8
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84–86	+½	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	..	5 7 6
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	..	4 13 11
718,100	,,	,,	7	Do. B	143–145	..	4 16 7
306,083	,,	Dec. 30	4	Do. Deb. Stk.	99–101	..	3 19 3
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅝	..	6 3 1
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	98–100	..	4 10 0
541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅞–12½	..	6 10 8
1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'tesh'd Con.	99½–100½	+¼	4 9 7
529,705	Stk.	Dec. 30	2½	Do. 3½ p.c. Deb.	83½–84½	..	4 2 10
55,940	10	Feb. 26	7/14.0	North Middlesex 7 p.c.	12½–13½	..	5 14 1
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	120–125	..	6 8 0
60,000	5	Mar. 26	10	Ottoman, Ltd.	7¼–7⅜	..	6 9 0
60,000	50	Feb. 23	13	Portsea, Island B	127–130	..	5 0 0
100,000	50	,,	12	Do. C	118–121	..	4 19 2
249,980	5	Oct. 15	8	Primitiva Ord.	6⅜–6¾	..	5 16 5
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5–5½	..	4 15 8
521,600	100	Dec. 1	4	,, 4 p.c. Deb.	93–95	..	4 4 3
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
275,000	5	Sept 26	12	San Paulo, Ltd.	—	..	—
150,000	10	April 8	6	Do. 6 p.c. Pref.	10¾–11¼*	..	5 6 8
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
135,000	Stk.	Mar. 12	10	Sheffield A	222–224	..	4 9 3
209,984	,,	,,	10	Do. B	221–223	..	4 9 8
523,500	,,	,,	10	Do. C	221–223	..	4 9 8
90,000	10	Oct. 15	7½	South African	10⅛–11½	..	6 10 5
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	109–111	..	4 18 6
1,895,445	,,	Jan. 15	8	Do. 3 p.c. Deb.	73–75	..	4 0 0
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	155–157	..	5 8 3
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
60,000	,,	,,	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
117,058	,,	Dec. 30	5	Southampton Ord.	101–104	..	4 16 2
594,740	Stk.	Nov. 13	5	Tottenham A 5 p.c.	135–138	..	5 6 10
120,000	Stk.	Feb. 12	7⅜	Tottenham B 3½ p.c.	115–117	..	5 0 5
543,940	,,	,,	5¼	District 4 p.c. Deb.	89–91	..	4 7 11
149,470	,,	Dec. 30	4	Tuscan, Ltd.	5–6	..	8 6 8
182,380	10	,,	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
149,900	10	Jan. 2	5	Tynemouth, 5 p.c. max.	108½–110½	..	4 10 6
236,476	Stk.	Mar. 12	5	Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
255,636	,,	,,	6⅜	,, B 3½ p.c.	129–134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
352,000	,,	,,	6⅜	Wimbledon 5 p.c.	117–122	..	5 0 5
98,000	,,	,,	6⅜	Epsom 5 p.c.	121–126	..	5 5 2
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	71–73	..	4 2 2

Prices marked * are "Ex Div."